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December 17, 2018

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC
V6Z 2N3

Attention: Mr. Patrick Wruck, Commission Secretary and Manager, Regulatory Support

Dear Mr. Wruck:

Re: FortisBC Energy Inc. (FEI or the Company)

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Inland Gas Upgrade Project (IGU Project or the Project)

Pursuant to sections 45 and 46 of the *Utilities Commission Act* (the Act), FEI applies to the British Columbia Utilities Commission (BCUC) for a CPCN for the IGU Project. The IGU Project is needed to mitigate the potential for rupture failure due to corrosion on 29 transmission laterals in the interior of BC. The scope of the IGU Project consists of the most cost-effective integrity management solution for each transmission lateral, as follows:

1. Retrofitting 11 transmission laterals to provide in-line inspection (ILI) capability;
2. Constructing pressure regulating stations on 14 transmission laterals to reduce the maximum operating pressure and resulting operating stress to below 30 percent of the specified minimum yield strength (SMYS) of the pipe; and
3. Replacing 4 transmission laterals with new pipe designed to operate at a stress below 30 percent of the SMYS of the pipe.

FEI also seeks BCUC approval for a deferral account pursuant to sections 59 and 61 of the Act to capture the costs of preparing the Application and evaluating the feasibility of and preliminary stage development of the IGU Project.

Request for Confidential Treatment of Certain Appendices

To support the Application, FEI has filed several appendices, with the following ones being filed confidentially pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents, established by Order G-1-16"

- Appendix J – Stantec FEED Report Documents
- Appendix L – Risk Analysis
- Appendix N – Financial Schedules

FEI respectfully requests that the BCUC hold the above listed documents confidential, and that such information should remain confidential after the regulatory process for this Application is completed. Below FEI outlines the reasons for keeping the information confidential.

Appendices J and L

Appendices J and L are engineering documents and should be kept confidential on the basis that they contain operationally sensitive information pertaining to the Company's assets. In particular, it identifies vulnerable points on the Company's gas transmission system and areas of risk to the Project including detailed information that if disclosed, could impede FEI's ability to work safely and reliably operate its gas system assets and could risk the safety of both its workers and the public. These documents also include cost estimates and identify Project risk. They should be kept confidential on the basis that FEI may be going to the market to seek competitive bids for the materials and construction work for the Project. If the estimated costs for the material and construction work are disclosed, FEI reasonably expects that its negotiating position may be prejudiced. For instance, the bidding parties with knowledge about the estimated costs may use the estimate costs as a reference for their bidding.

Appendix N

Appendix N includes cost estimates, containing capital cost estimates for the Project. They should be kept confidential on the basis that FEI may be going to the market to seek competitive bids for the materials and construction work for the Project. If the estimated costs for the material and construction work are disclosed, FEI reasonably expects that its negotiating position may be prejudiced. For instance, the bidding parties with knowledge about the estimated costs may use the estimate costs as a reference for their bidding.

Access to Confidential Information for Interveners

Should parties that choose to register in the review of this Application require access to some or all of the information filed confidentially, FEI has provided a proposed Undertaking of Confidentiality in Appendix T-3, to be executed before confidential information may be released to registered parties under the terms of the undertaking. FEI has no objection to providing confidential information to its customary and routine intervener groups representing customer interests. FEI requests that the BCUC provide it with the opportunity to file comments on any objections or concerns that it may have, should any other registered parties seek access to confidential information.

If further information is required, please contact Cari Kobialko at (604) 592-7612.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Doug Slater

Attachments

cc (email only): Registered Parties in the Annual Review for 2019 Rates

FORTISBC ENERGY INC.

Application for a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project

Volume 1 - Application

December 17, 2018

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1. APPLICATION

1.1 *APPROVALS SOUGHT*

FortisBC Energy Inc. (the Company or FEI), applies to the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) for its Inland Gas Upgrades Project (IGU Project or Project) (the Application) pursuant to sections 45 and 46 of the *Utilities Commission Act* (the Act). The IGU Project will implement the most cost-effective integrity management solutions to mitigate the potential for rupture failure on 29 laterals in the interior region of BC as described in the Application, at an estimated capital cost of $362.904 million[1] and over a six-year Project period between 2019 and 2024.

FEI is also seeking approval of a deferral account, entitled the "IGU Application and Preliminary Stage Development Costs Deferral Account", pursuant to section 59 to 61 of the Act. This new deferral account is required to capture the costs of preparing the Application and the costs of preliminary stage development of the IGU Project. The net-of-tax balance of the total application and preliminary stage development cost is $0.991 million. The total Project Cost, including the capital costs as well as the application and preliminary stage development costs, is $363.895 million.

A draft Procedural Order and draft Final Order are included in Appendix T-1 and T-2 respectively.

1.1.1 CPCN for IGU Project

The IGU Project is needed to mitigate the potential for rupture failure due to corrosion on 29 transmission pipeline laterals on FEI's system that were constructed between 1957 and 1998, have a nominal pipe size (NPS) 6 or greater, operate as transmission[2] pipelines and are not capable of being in-line inspected (referred to in this Application as the 29 Transmission Laterals). FEI owns and operates approximately 3 thousand kilometres of transmission pressure (TP) pipelines in the province of British Columbia. The 29 Transmission Laterals collectively make up approximately 410 kilometres of pipe length. Because the 29 Transmission Laterals operate at transmission operating stress levels, there is a potential that corrosion in these pipelines, if left undetected, could result in rupture. FEI's current method of integrity verification for these laterals, Modified External Corrosion Direct Assessment (ECDA), will not detect active corrosion under circumstances found on FEI's system and therefore it is not an acceptable solution over the long term. As such, FEI is proposing alternate integrity management solutions that will mitigate the potential for rupture due to corrosion on the 29 Transmission Laterals.

[1] Cost estimate in as-spent dollars, including Allowance for Funds Used During Construction (AFUDC) and cost of removal.

[2] Transmission pipelines operate as transmission operating stress levels of 30% or more of of the specified minimum yield strength (SMYS) of the pipe.

The IGU Project will construct assets or retrofit existing assets to implement cost-effective integrity management solutions for each lateral. Specifically, the IGU Project will:

1. Retrofit 11 laterals to provide in-line-inspection[3] (ILI) capability (which mitigates approximately 310 kilometres of pipe length);
2. Construct pressure regulating stations on 14 laterals to reduce the maximum operating pressure and resulting operating stress to below 30 percent of the specified minimum yield strength (SMYS) of the pipe (which mitigates approximately 90 kilometres of pipe length); and
3. Replace 4 laterals with new pipe designed to operate at a stress below 30 percent of the SMYS of the pipe (which mitigates approximately 9 kilometres of pipe length).

A detailed description of the 29 Transmission Laterals is provided in Appendix A of the Application.

Based on the Project construction schedule and an estimated total Project cost of $363.895 million[4], the total delivery rate impact of the Project is estimated to be 4.31 percent over six years from 2020 to 2025. Since the Project will be completed in phases over six years, there will be a delivery rate impact annually for the portion of the Project that is completed each year. The average rate impact is approximately 0.71 percent per year or $0.029 per GJ annually from 2020 to 2025. For a typical FEI residential customer consuming an average of 90 GJ per year, this equates an approximate average increase of $2.63 annually over the six years from 2020 to 2025.

FEI submits that the IGU Project is in the public interest and requests that the BCUC grant a CPCN for its construction and operation.

1.1.2 IGU Application and Preliminary Stage Development Costs Deferral Account

FEI is also seeking approval of a deferral account, entitled the "IGU Application and Preliminary Stage Development Costs Deferral Account", to capture the regulatory costs of this Application and the costs expended for the purpose of evaluating the feasibility of and preliminary development of the Project. The Application costs include expenses for legal review, BCUC costs and BCUC approved intervener costs, and forecast costs to support the hearing process. The preliminary stage development costs include expenses incurred by FEI internally as well as third-party consultants for assessing the feasibility of the Project, developing and evaluating preliminary design and alternatives. The IGU Application and Preliminary Stage Development costs will be recorded in a non-rate base deferral account on a net-of-tax basis attracting a

[3] In-line inspection involves the insertion of a data collection device (commonly referred to as an ILI tool or pig) inside an operating pipeline to obtain indirect measurement of imperfections (e.g. metal loss, dents, and mechanical damage) that may adversely affect its integrity.

[4] Cost estimate in as-spent dollars, including Allowance for Funds Used During Construction (AFUDC) and cost of removal.

weighted average cost of capital (WACC) return until December 31, 2019 and will be transferred to rate base on January 1, 2020 with a three-year amortization period. The balance of the IGU Application and Preliminary Stage Development Costs Deferral Account is forecasted to be $0.991 million as at December 31, 2019[5]. This request is set out in more detail in Section 6.3.3 of the Application.

1.1.3 Confidential Filings Request

Certain Appendices to the Application contain operationally sensitive information, including detailed information that, if disclosed, could impede FEI's ability to work safely and reliably operate its gas system assets and could risk the safety of both its workers and the public. As well, the Confidential Appendices contain market sensitive information that should be kept confidential so as not to influence the construction contractor selection process for the Project. FEI will mark all confidential information as such, where applicable.

In accordance with the BCUC's Rules of Practice and Procedure established by Order G-1-16, regarding Confidential Documents, FEI requests that the interveners requesting access to confidential information execute an Undertaking of Confidentiality. A sample of the Undertaking of Confidentiality is included in Appendix T-3.

1.2 *EXECUTIVE SUMMARY*

1.2.1 Introduction

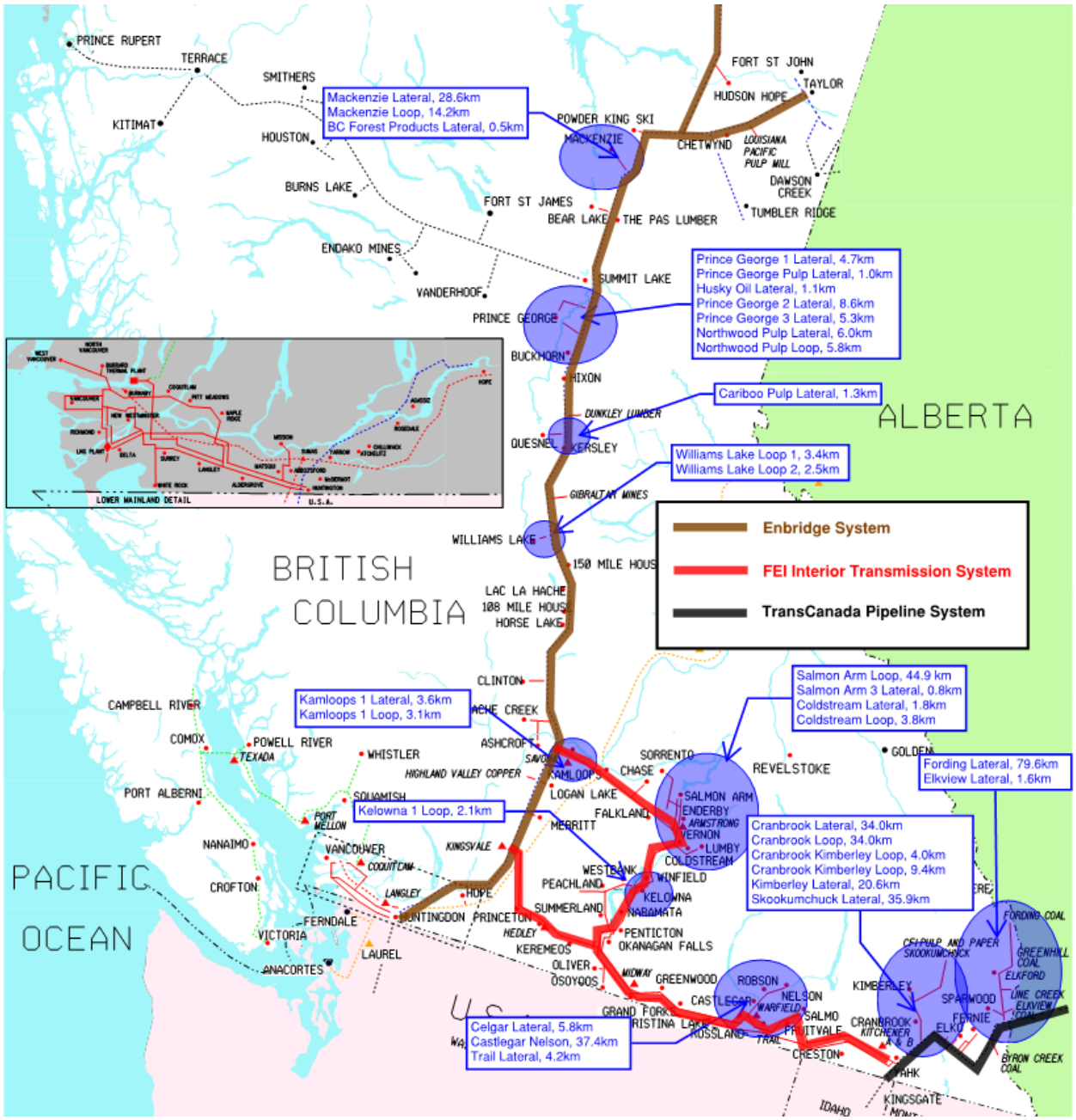
The 29 Transmission Laterals are located in the interior of British Columbia and have a nominal pipe size of 6 inches (NPS 6, outside diameter (OD) or 168mm), 8 inches (NPS 8 or 219mm) or 10 inches (NPS 10 OD or 273mm). The 29 Transmission Laterals do not have ILI capability, and are operating at a hoop stress[6] of 30 percent or more of the SMYS of the pipe.

The geographical layout of the 29 Transmission Laterals are shown in Figure 1-1 below.

[5] The total Application and Preliminary Stage Development cost is $1.321 million, which attracts approximately $0.357 million of tax offset and $27 thousand of financing charges at the Company's weighted average cost of capital.

[6] The operating hoop stress of a pipeline is the force per unit area exerted in the circumferential direction of the pipe wall due to the internal pressure of the fluid in the piping.

Figure 1-1: Location of 29 Transmission Laterals for the IGU Project



FEI's transmission laterals within the interior operating region are divided into three categories: (1) laterals that have gas supplied by the TransCanada Pipeline (TCPL), (2) laterals that have gas supplied by Enbridge and (3) laterals that have gas supplied by FEI's Interior Transmission System (ITS) mainlines.

These laterals feed large industrial customers, commercial customers and downstream district stations which supply natural gas to many of the municipalities in the interior British Columbia

regions including the Northern Region, the Thompson Region, the Okanagan and the Kootenays. These regions comprise approximately 167 thousand FEI customers.

1.2.2 Project Justification

The objective of the Project is to mitigate the potential for transmission pipeline rupture due to corrosion on the 29 Transmission Laterals. Rupture of a transmission pipeline could have significant safety, reliability, environmental and regulatory consequences and such an occurrence would be unacceptable to FEI, the public and its regulators.

FEI has a comprehensive Integrity Management Program (IMP) as required by the BC Oil and Gas Commission (BC OGC). As part of the IMP, FEI's current strategy for detecting, assessing and monitoring the condition of its transmission pipelines relies primarily on the following two methods:

1. In-Line Inspection (ILI) – This method includes the insertion of a data collection device (commonly and variously referred to as an ILI tool, smart tool or pig) inside an operating pipeline to obtain indirect measurement and locations of imperfections such as metal loss, dents, and mechanical damage that may adversely affect the pipeline; and
2. Modified External Corrosion Direct Assessment (Modified ECDA) – This method employs above-ground cathodic protection (CP) surveys and coating evaluations, supplemented with integrity digs where warranted to evaluate asset condition.

The 29 Transmission Laterals were not designed and constructed with ILI capabilities and have obstructions that prevent the clear passage of ILI tools. FEI is actively monitoring the condition of these 29 Transmission Laterals through Modified ECDA.

FEI has identified limitations of Modified ECDA given the occurrence of the process of CP shielding on its pipeline system. Modified ECDA will not detect sites that may be experiencing active corrosion where CP shielding occurs. As such, FEI believes that the status quo is no longer acceptable over the long term.

As corrosion is the leading cause of transmission pipeline failures in British Columbia, the Project is proposing several alternatives to the status quo that will provide for continued safe and reliable long-term operation of the 29 Transmission Laterals. The Project, completed proactively over a reasonable planning horizon and in consideration of the feasibility and benefits of alternate integrity management strategies, demonstrates FEI's commitment to continual improvement within its integrity management program, and is an appropriate response to the potential for rupture failure due to corrosion.

1.2.3 Alternatives Analysis and Recommended Solution

To mitigate the potential for rupture failure of the 29 Transmission Laterals due to corrosion, FEI evaluated seven alternatives against the criteria of: (1) integrity and asset management

capability, (2) Project execution and lifecycle operation, and (3) present value of incremental annual revenue requirement. The seven alternatives are:

1. Status Quo: Modified External Corrosion Direct Assessment (Modified ECDA);
2. Pipeline exposure and re-coat (PLE);
3. Hydrostatic testing program (HSTP);
4. Pressure regulating station (PRS);
5. In-line inspection (ILI);
6. Pipeline replacement (PLR); and
7. Robotic Inspection (ROB).

Applying the above three criteria, FEI determined that only Alternative 4: PRS, Alternative 5: ILI and Alternative 6: PLR provided a technically feasible and cost effective means of achieving the Project goal of mitigating the potential for rupture due to corrosion.

The PRS alternative involves the construction of a pressure regulating station to lower the maximum operating pressure of the lateral to below 30% SMYS. When operating at these reduced stress levels, it is generally accepted that pipeline failures due to pressure-dependent hazards (e.g. corrosion) will have the potential to leak rather than rupture, significantly reducing the potential consequences of failure.

The ILI alternative involves modifications to the lateral and the installation of ILI tool launchers and receivers to enable ILI. ILI involves the insertion of an ILI tool into the pipeline to collect indirect measurements of the pipeline's anomalies such as dents and metal loss that can adversely affect its integrity. In order to successfully run an ILI tool, the laterals need to be modified such as by replacing bends, valves on the mainline, and barring tees so that the tool can travel through the pipeline uninhibited.

The use of ILI will give FEI a much higher level of confidence in the current pipe condition of the respective laterals, will provide information about anomalies caused by the time dependent threat of external corrosion, and will enable FEI to proactively manage these pipelines and mitigate the potential for rupture failure.

The PLR alternative involves replacing the existing pipeline with a new pipeline including accommodations for future ILI capability with limited retrofits. This option also allows for the corrosion-related rupture potential to be mitigated by designing the pipe with an operating stress of less than 30 percent SMYS. When operating at reduced stress levels, it is generally accepted that pipeline failures due to pressure-dependent hazards such as corrosion will have the potential to leak rather than rupture, significantly reducing the potential consequences of failure.

Of the three feasible alternatives, the preferred alternative was selected based on a technical and financial evaluation. Table 1-1 below lists the preferred alternative for each lateral.

Table 1-1: Preferred Alternatives for Each Lateral

Line/ Loop ID No.	Line/Loop Full Name	Line Length (km)	Preferred Alternative
1	Mackenzie Lateral 168	28.6	In-line Inspection
2	Mackenzie Loop 168	14.2	In-line Inspection
3	BC Forest Products Lateral 168	0.5	Pipeline Replacement
4	Prince George 3 Lateral 219	5.3	Pressure Regulating Station
5	Northwood Pulp Lateral 168	6.0	Pressure Regulating Station
6	Northwood Pulp Loop 219	5.8	Pressure Regulating Station
7	Prince George 1 Lateral 168	4.7	In-line Inspection
8	Prince George Pulp Lateral 168	1.0	Pressure Regulating Station
9	Husky Oil Lateral 168	1.1	Pressure Regulating Station
10	Prince George 2 Lateral 219	8.6	Pressure Regulating Station
11	Cariboo Pulp Lateral 168	1.3	Pipeline Replacement
12.1	Williams Lake Loop 1 168	3.4	Pressure Regulating Station
12.2	Williams Lake Loop 2 168	2.5	Pressure Regulating Station
13.1	Kamloops 1 Lateral 168	3.6	Pipeline Replacement
13.2	Kamloops 1 Loop 168	3.1	Pipeline Replacement
14	Salmon Arm Loop 168	44.9	In-line Inspection
15	Salmon Arm 3 Lateral 168	0.8	Pipeline Replacement
16	Coldstream Lateral 219	1.8	Pressure Regulating Station
17	Coldstream Loop 168	3.8	Pressure Regulating Station
18	Kelowna 1 Loop 219	2.1	Pressure Regulating Station
19	Celgar Lateral 168	5.8	Pressure Regulating Station
20	Castlegar Nelson 168	37.4	Pressure Regulating Station
21	Trail Lateral 168	4.2	Pressure Regulating Station
22.1	Fording Lateral 219	34.5	In-line Inspection
22.2	Fording Lateral 168	45.1	In-line Inspection
23	Elkview Lateral 168	1.6	Pressure Regulating Station
24	Cranbrook Lateral 168	34.0	In-line Inspection
25	Cranbrook Loop 219	34.0	In-line Inspection
26	Cranbrook Kimberley Loop 219	4.0	In-line Inspection
27	Cranbrook Kimberley Loop 273	9.4	In-line Inspection
28	Kimberley Lateral 168	20.6	In-line Inspection
29	Skookumchuck Lateral 219	35.9	In-line Inspection

1.2.4 Project Costs and Rate Impact

The Total Cost of the Project (as-spent dollars) is $363.895 million, which includes $362.904 million of Project capital budget (as-spent dollars) and $0.991 million of Project Deferral related to the Application and Preliminary Stage Development Costs. The total delivery rate impact of the Project is 4.31 percent or $0.175 per GJ over 6 years from 2020 to 2025.

The following table summarizes the total forecast capital and deferred costs for the Project.

Table 1-2: Summary of Forecast Capital Budget and Deferred Costs ($millions)

	2018 $	As-Spent $	AFUDC	Tax Offset	TOTAL
Type of Preferred Option					
In-line Inspection (ILI) - 11 Laterals	241.204	258.095	10.903	-	268.998
Pipeline Replacement (PLR) - 4 Laterals	28.414	30.427	1.323	-	31.750
Pressure Regulating Station (PRS) - 14 Laterals	53.388	58.635	3.197	-	61.831
Total Addition to Plant - Total 29 Laterals	323.006	347.157	15.422	-	362.579
Abandonment/Demolition Cost	0.290	0.311	0.014	-	0.325
Subtotal - Project Capital Budget	*323.296*	*347.468*	*15.436*	-	*362.904*
IGU Project Application Cost	0.390	0.390	0.008	(0.105)	0.293
IGU Project Preliminary Stage Development Cost	0.931	0.931	0.019	(0.251)	0.698
Subtotal - Project Deferral Cost	*1.321*	*1.321*	*0.027*	*(0.357)*	*0.991*
TOTAL Project Cost	***324.617***	***348.789***	***15.463***	***(0.357)***	***363.895***

The Project is planned to be completed in phases over six years from 2019 to 2024. The table below summarizes the associated amount of the total Project capital costs that will be completed in each year over the duration of the Project. Refer to the Section 5.4 of the Application for more detail related to the Project's construction and operating schedule.

Table 1-3: Amount of Project Capital Complete and in-service from 2019-2024 ($ millions)

	Project complete and in-service each year, 2019-2024 ($ millions) (To be transfer to Rate Base January 1 of each following year)						
	2019	2020	2021	2022	2023	2024	TOTAL
In-line Inspection (ILI) - 11 Laterals	-	51.034	76.549	65.629	52.430	23.412	**269.055**
Pipeline Replacement (PLR) - 4 Laterals	-	-	11.374	18.864	1.780	-	**32.018**
Pressure Regulating Station (PRS) - 14 Laterals	-	-	-	14.979	20.859	25.993	**61.831**
Overall Project Capital Budget In-Service	*-*	*51.034*	*87.923*	*99.471*	*75.070*	*49.406*	*362.904*
Overall Project % In-Service	0%	14%	24%	27%	21%	14%	**100%**

As the Project is planned to be completed and placed into in-service in phases, there will be an annual delivery rate impact. The estimated annual revenue requirement of the Project and the resulting annual delivery rate impacts from 2020 to 2025, when compared to the currently approved 2018 delivery rates, are shown in the table below. The amount of the Project capital cost to be placed in-service each year as shown in Table 1-4 above will be transferred to rate base on January 1 of each following year; therefore, the delivery rate impact will occur in the following year of each in-service year.

Table 1-4: Percent Rate Impact annually from 2020 to 2025

	2020	2021	2022	2023	2024	2025
Annual Revenue Requirement, Incremental to 2018 Approved, Non-Bypass ($ millions)	(0.169)	2.909	9.898	19.249	28.396	34.291
% Increase to 2018 Approved Revenue Requirement, Non-Bypass (G-196-17)	***(0.02%)***	***0.37%***	***1.24%***	***2.42%***	***3.57%***	***4.31%***
Incremental % Rate Impact (Year-over-Year)	***(0.02%)***	***0.39%***	***0.88%***	***1.16%***	***1.12%***	***0.72%***

The Project will result in a delivery rate impact of 4.31 percent, when compared to currently approved 2018 delivery rates, over six years from 2020 to 2025. Since the Project will be completed in phases, the average delivery rate impact per year for the duration of the Project is approximately 0.71 percent or $0.029 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to approximately an average increase of $2.63 per year over the six years.

1.2.5 Environmental and Archaeological Evaluation

An Environmental overview assessment (EOA) and an archaeological overview assessment (AOA) were completed to identify areas of environmental and archaeological sensitivities, potential Project interactions, the need for further investigations prior to construction, and associated permitting requirements.

Based on the EOA, the environmental risk of the Project is low and any potential environmental impacts from the Project can be mitigated through the application of standard environmental protection and mitigation measures.

The AOA concluded that the majority of the expected Project footprint is considered to have low archaeological potential due to the amount of previous disturbance. An Archaeological Impact Assessments (AIA) has been recommended for ground disturbance activities in areas identified as moderate or high potential through the AOA process.

FEI will complete AIAs where soil-disturbing activities are expected to take place in areas identified as moderate or high archaeological potential in the AOA. The environmental and archaeological requirements for the Project will continue to be refined and lateral-specific plans will be developed during the detailed design phase. Project works will adhere to best practices and environmental permits will be obtained where appropriate.

1.2.6 Consultation and Engagement

Consultation, engagement and communication with the public, local government, Indigenous communities and other stakeholders was a critical component in the development of FEI's IGU Project.

FEI has sent out notifications to potentially directly affected customers and stakeholders through letters, bill inserts and advertisements. FEI has also held numerous one-on-one meetings with government authorities and responded to requests for further information. To date, no significant concerns have been raised with regard to the Project.

FEI has received some questions about the Project related to replacement of a lateral that traverses a Municipal park located in the City of Kamloops. The City of Kamloops has requested that park access be maintained, that park improvements be included as part of the Project restoration efforts and that FEI hold open houses closer to construction as to the use of the park. FEI has committed to continued work with the City of Kamloops to address any concerns. FEI will continue to consult with the public as the Project progresses, will track concerns raised and will work with customers and stakeholders to address any outstanding items.

The City of Kimberley also expressed concern regarding the North Star Rails to Trails corridor, a 25km nature trail that connects the City of Kimberley to the City of Cranbrook. The City of Kimberley requested that the trail remain open during construction. FEI is aware of the concern and will continue to work with the City of Kimberley through future meetings closer to the construction period.

FEI has also engaged Indigenous communities and leadership in the area of the Project. FEI engaged early with Indigenous communities that may potentially be affected by the Project to provide information about the Project, describe any potential impacts, understand the interests in the area, and provide an opportunity for indigenous communities to identify additional impacts and to give input on the Project. Engagement was initiated by notification letters, and then followed by face-to-face meetings as requested.

A number of communities expressed interest in working on the Project in some capacity. Follow up meetings will be scheduled with these communities as additional information around contracting and procurement becomes available.

Some concerns such as those related to sensitive areas require additional, site specific information that is not available at this stage of the Project. FEI will continue to engage with those communities that have requested additional information with follow up meetings during detailed design and prior to construction.

FEI will continue to notify and engage with Indigenous communities as the Project progresses, particularly through the BC OGC process.

FEI considers the communication plan and the public consultation activities to the time of filing the Application have been sufficient, appropriate and reasonable to meet the requirements of the CPCN Guidelines. FEI will continue to consult with stakeholders regarding construction timelines, construction spaces, plans on mitigating traffic disruptions (where applicable) and public safety. Further consultation will continue prior to and throughout construction to help inform local government and residents about construction activities in their area in an effort to minimize impacts.

1.2.7 British Columbia's Energy Objectives and FEI's Long-Term Resource Plan

In alignment with considerations for the issuance of a CPCN, FEI confirms that the Project supports the applicable British Columbia's energy objectives and that the Project was identified

within FEI's most recent long term resource plan. The Project supports the energy objective of encouraging economic development and the creation and retention of jobs. The Project is anticipated to have positive employment impacts and will contribute to the local economy in the Interior regions of BC and economic spin-offs will be created, such as increased demand for local hospitality services.

1.2.8 Conclusion

FEI believes that the Project is necessary and in the public interest. FEI requests that the BCUC approve the Project as set out in the Application.

1.3 *PROPOSED REGULATORY PROCESS*

FEI believes that a written hearing process with two rounds of Information Requests from the BCUC and interveners will provide for an appropriate and efficient review of the Application. FEI proposes the regulatory timetable set out in Table 1-5 below.

FEI respectfully requests a BCUC decision on the Project within three months of the close of the submissions in order to maintain its schedule for tendering and contract award. If the Application is approved, FEI plans to begin construction in early Q2 2020, and is expecting to have all laterals completed by Q3 2024 with contractor demobilization and restoration to occur in late 2024.

Table 1-5: Proposed Regulatory Timetable

ACTION	DATE (2019)
BCUC Issues Procedural Order	Week of January 7
FEI Publishes Notice by the Week of	Week of January 21
Intervener and Interested Party Registration	Thursday, February 7
BCUC Information Request No. 1	Tuesday, February 12
Intervener Information Request No. 1	Tuesday, February 19
FEI Response to Information Requests No. 1	Thursday, March 14
BCUC and Intervener Information Request No. 2	Tuesday, April 9
FEI Response to Information Requests No. 2	Tuesday, May 7
FEI Written Final Submission	Wednesday May 22
Intervener Written Final Submission	Thursday, June 6
FEI Written Reply Submission	Thursday, June 20

1.4 ORGANIZATION OF THE APPLICATION

The Application provides detailed information in support of the Project in accordance with the guidelines set out in the BCUC's 2015 Certificates of Public Convenience and Necessity Application Guidelines (CPCN Guidelines).

The remainder of the Application is organized into the following sections:

- Section 2 provides an overview of the Applicant, and provides information on FEI's financial and technical capabilities to undertake the Project;
- Section 3 describes the justification for the Project;
- Section 4 describes the alternatives considered, the criteria for evaluating alternatives, and details the technical and financial evaluation of each of the alternatives;
- Section 5 provides a detailed description of the proposed Project, including construction, design, resource planning and management, schedule, as well as setting out a risk analysis and potential Project impacts;
- Section 6 provides the cost estimate, the assumptions upon which the financial analysis is based and the rate impacts;
- Section 7 provides an overview of the Project environment, including a discussion of the environmental and socio-economic impacts the Project may have and FEI's plans to mitigate those impacts;
- Section 8 discusses FEI's public consultation and communication efforts regarding the Project and FEI's consultation with indigenous communities potentially impacted by the Project; and
- Section 9 describes how the Project supports BC's energy objectives and its inclusion within FEI's most recent long term resource plan.

2. APPLICANT

2.1 NAME, ADDRESS AND NATURE OF BUSINESS

FEI is a company incorporated under the laws of the Province of British Columbia and is a wholly-owned subsidiary of FortisBC Holdings Inc., which in turn is a wholly-owned subsidiary of Fortis Inc., a Canadian-based utility holding company. FEI maintains an office and place of business at 16705 Fraser Highway, Surrey, British Columbia, V4N 0E8.

FEI is the largest natural gas distribution utility in British Columbia, providing sales and transportation services to over 1 million residential, commercial, and industrial customers in more than 100 communities throughout British Columbia. FEI's distribution network delivers gas to more than eighty percent of the natural gas customers in British Columbia.

2.2 FINANCIAL CAPACITY

FEI is regulated by the BCUC and is capable of financing the Project. FEI has credit ratings for senior unsecured debentures from Dominion Bond Rating Service and Moody's Investors Service of A and A3, respectively.

2.3 TECHNICAL CAPACITY

FEI has designed and constructed a system of integrated high, intermediate and low-pressure pipelines, and operates more than 49,000 kilometres of natural gas transmission and natural gas distribution mains and service lines in British Columbia. This transmission and distribution infrastructure serves over 1 million customers in British Columbia.

2.4 COMPANY CONTACT

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3. PROJECT NEED AND JUSTIFICATION

3.1 *INTRODUCTION*

The objective of the IGU Project is to mitigate the potential for rupture due to corrosion on the 29 Transmission Laterals. As with all buried steel pipelines, the 29 Transmission Laterals are susceptible to corrosion, which is the leading cause of transmission pipeline incidents in British Columbia. Corrosion in transmission pipelines, which operate at a hoop stress of 30% or more of the specified minimum yield strength (SMYS) of the pipe, can result in a rupture, which can have significant safety, reliability, environmental and regulatory consequences. In alignment with the practices of its peer Canadian transmission pipeline operators and the expectations of the public and regulators, FEI is committed to adopting integrity management solutions to prevent ruptures due to external corrosion on its system.

There are multiple strategies available for operators to mitigate the potential for rupture on transmission pipelines due to external corrosion. FEI currently employs Modified External Corrosion Direct Assessment (ECDA) to detect, assess and monitor the condition of the 29 Transmission Laterals. Modified ECDA is a method of evaluating pipeline condition that relies on information collected from above-ground surveys (indirect inspection), and investigative digs (direct evaluation). Above-ground surveys can provide data regarding both cathodic protection (CP) system performance and the condition of the pipeline coating. However, this method is no longer an acceptable means to manage the potential for corrosion-related rupture of the 29 Transmission Laterals over the long term. FEI's inspection of its system has shown that active corrosion has occurred on cathodically-protected pipe due to a process called CP shielding. CP shielding is where the CP current is prevented from reaching the pipeline and where there is CP shielding, Modified ECDA will not detect sites that may be experiencing active corrosion.

In-line inspection (ILI) provides effective integrity verification as it enables an operator to identify imperfections, and to focus pipeline rehabilitation efforts to specific locations. ILI also enables proactive asset management by providing pipeline wall condition data (including changes over time) that can inform long-term asset planning. ILI is increasingly being adopted by industry for managing corrosion of transmission pipelines and mitigating their potential for rupture. It is used on a majority of transmission pipelines on FEI's system and has proven highly effective in detecting and sizing potentially injurious pipe imperfections. ILI is now technically feasible to be employed as a mitigation measure in natural gas pipelines down to a nominal pipeline size of 6 inches. Due to asset management practices at the time, the 29 Transmission Laterals were not designed and constructed with ILI capabilities.

In addition to ILI, other integrity management methods that can mitigate the potential for rupture due to corrosion include replacing the pipeline with a new pipeline or installing a pressure regulating station to lower the operating pressure of the pipeline and resulting operating stress to below 30 percent of the SMYS of the pipe, significantly reducing the potential consequences of failure.

Given FEI's observation of corrosion on cathodically-protected pipe on its system, experience with the limitations of Modified ECDA in detecting corrosion imperfections, and the availability and adoption in the industry of integrity management solutions that will mitigate the potential for rupture, FEI needs to employ, on a planned proactive basis, other integrity management solutions to mitigate the potential for rupture due to corrosion on the 29 Transmission Laterals.

The Project will mitigate the potential for rupture on the 29 Transmission Laterals by either:

1. modifying a lateral to facilitate the clear passage of ILI tools to make ILI possible so that external corrosion can be managed;
2. replacing the pipeline with a new pipeline designed with an operating stress of under 30% SMYS to address the potential for rupture; or
3. installing a pressure regulating station to lower the operating pressure of the pipeline and resulting operating stress to below 30% SMYS to address the potential for rupture.

In the following sections, FEI describes the Project background and the main drivers for the IGU Project in more detail.

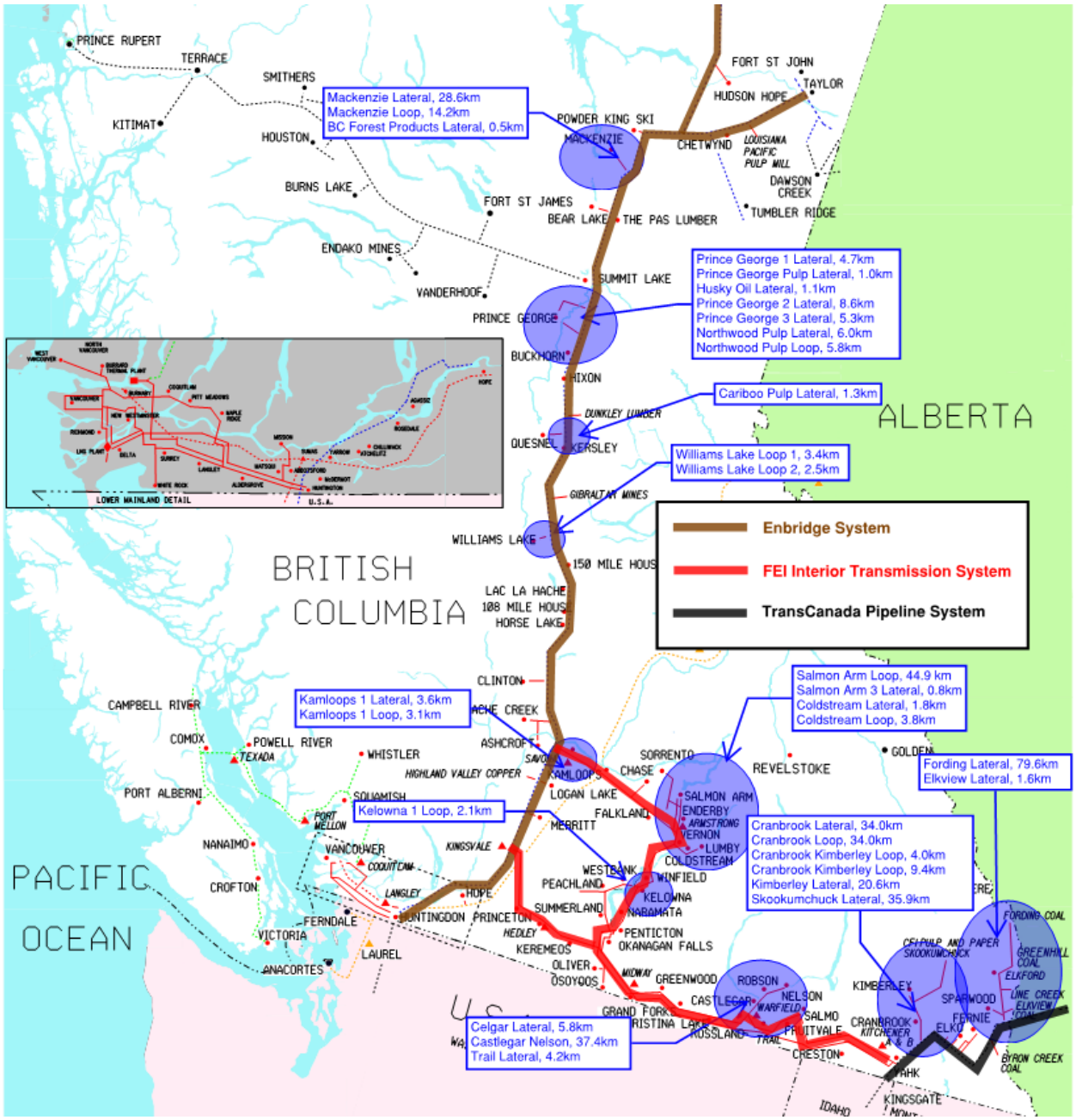
3.2 GEOGRAPHICAL LOCATION OF THE 29 LATERALS

FEI owns and operates approximately 3000 kilometres of transmission pressure (TP) pipelines in the province of British Columbia. FEI's TP pipeline system, with operating pressures ranging from 2070 to 9930 kPa, is comprised of mainlines ranging in size from Nominal Pipe Size (NPS) 6 (168 mm outside diameter (OD)) to NPS 42 (1067 mm OD), as well as laterals off of the mainline transmission systems ranging from NPS 2 (60 mm OD) to NPS 12 (323 mm OD) serving communities and industrial customers. Many of these pipelines are single feed laterals and provide the only source of natural gas supply for communities and businesses.

The 29 Transmission Laterals are located in FEI's interior operating region and collectively make up approximately 410 kilometres of TP pipelines. FEI's transmission laterals within the interior operating region are divided into three categories: (1) laterals that have gas supplied by the TransCanada Pipeline (TCPL), (2) laterals that have gas supplied by Enbridge and (3) laterals that have gas supplied by FEI's Interior Transmission System (ITS) mainlines. Figure 3-1 shows the location of the 29 laterals relative to the location on FEI's transmission system[7].

[7] In addition to the 29 Transmission Laterals within the scope of the Project, FEI has one additional transmission lateral of NPS 6 or greater within its system (part of its Coastal Transmission System) operating at a stress of above 30 percent SMYS that does not already have ILI capability. This lateral is planned to be addressed through a separate project.

Figure 3-1: Overview of the Transmission System in Interior British Columbia



These laterals feed large industrial customers, commercial customers and downstream district stations which supply natural gas to many of the municipalities in the interior British Columbia regions including the Northern Region, the Thompson Region, the Okanagan and the Kootenays. Collectively, these regions supply approximately 167 thousand FEI customers.

For a list of the 29 Transmission Laterals within the scope of the Project, please refer to Appendix B.

3.3 POTENTIAL FAILURE BY RUPTURE OF THE 29 TRANSMISSION LATERALS

The 29 Transmission Laterals do not have ILI capability and are operating at a hoop stress of 30 percent or more of the SMYS of the pipe and therefore have the potential to fail by rupture due to corrosion. A rupture is an instantaneous release of natural gas that impacts the operation of a pipeline segment such that the pressure of the segment cannot be maintained. In contrast, a leak failure can be characterized as a limited loss of containment that does not represent a significant safety hazard.[8] Rupture failures of the 29 Transmission Laterals are unacceptable due to potential safety, reliability, environmental and regulatory consequences. The following provides a more detailed discussion of the status of the 29 Transmission Laterals, and the causes and consequences of failure by rupture that FEI aims to ensure do not occur on its system.

3.3.1 Corrosion is the Leading Cause of Pipeline Failure

Pipeline failures can result from a number of causes such as damage by a third party, material defects and natural hazards. The leading cause of transmission pipeline failures in British Columbia is the deterioration of pipe condition caused by the time-dependent hazard of corrosion[9]. The BC OGC issued a Pipeline Performance Summary, 2016 Annual Report on November 23, 2017, identifying corrosion metal loss as the leading cause of failures of regulated pipelines for all years included in the report (i.e., 2011 to 2016) (Appendix C).

3.3.2 Evidence of External Corrosion on FEI's System

Through active pipe condition monitoring within its integrity management program, FEI has confirmed external corrosion on parts of its system and considers this to be a relevant hazard that requires ongoing management.

Proactive external corrosion management of buried steel pipelines is achieved primarily through external coatings in conjunction with CP. CP is the application of an electrical current to the pipeline to minimize the natural corrosion tendency of buried steel. CP provides a secondary defense where imperfections in the pipeline coating may exist. Industry and FEI's experience recognizes that, although CP is being applied to a pipeline, corrosion can still occur due to a process called CP shielding. CP shielding is where the CP current is prevented from reaching the pipeline, due to situations such as the presence of disbonded pipe coatings, large rocks, or foreign structures.

FEI has experienced CP shielding on its pipeline system. Specifically, 72 of 90 integrity digs conducted on FEI's in-line inspected transmission pipelines in 2017 showed evidence of active corrosion on cathodically protected pipe. This means that the CP current designed to prevent corrosion is being prevented in these cases from reaching the steel surface of the pipeline.

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[8] This definition is consistent with CSA Z662-15 Clause O.1.4.

[9] Corrosion is the deterioration of metal that results from a reaction with the environment, which changes the iron, contained in pipe to iron oxide (rust). External corrosion occurs due to environmental conditions on the outside of a pipeline.

Further illustrating the presence of CP shielding in the FEI system is the NPS 20 Coquitlam to Vancouver pipeline. This pipeline required replacement as part of the Lower Mainland Intermediate Pressure System Upgrade Project in part due to CP shielding.

As FEI has demonstrated active corrosion on its system due to CP shielding, FEI must implement integrity management solutions to mitigate the potential for rupture due to this corrosion.

3.3.3 Transmission Pipelines Operating Over 30 percent SMYS can Fail by Rupture

A pipeline's potential to fail by rupture due to corrosion can be determined by comparing the pipeline's operating hoop stress to the SMYS of the pipe. The operating hoop stress of a pipeline is the force per unit area exerted in the circumferential direction of the pipe wall due to the internal pressure of the fluid in the piping. The yield strength of a pipe is the level of stress where the pipe begins to permanently deform (yield). The SMYS of a pipe is the minimum yield strength prescribed by the specification or standard to which a material is manufactured.

A threshold of 30 percent for the ratio of a pipeline's operating hoop stress as compared to the SMYS of the pipe has been adopted by the Canadian Standards Association Oil & Gas Pipeline Systems standard, CSA Z662, as a delineator between a transmission pipeline and a gas distribution system.[10] It is generally accepted by FEI and the Canadian pipeline industry that a pipeline operating at or above 30 percent SMYS has a potential to fail by rupture, whereas a pipeline operating below 30 percent SMYS would have a potential to leak. The CSA Z662 delineation is supported by a 2004 ASME International Pipeline Conference Paper entitled "A Review of the Time Dependent Behaviour of Line Pipe Steel"[11] by Andrew Cosham and Phil Hopkins, which indicates that full scale tests on part-wall (e.g., a corrosion defect that has not penetrated through the full thickness of the pipe) and through-wall defects (e.g. a corrosion defect that has penetrated through the full thickness of the pipe) showed that it is very unlikely that a part-wall defect will fail as a rupture at a stress level less than 30 percent.

3.3.4 Consequences of Transmission Pipeline Rupture

Rupture of a transmission pipeline could have safety, reliability, environmental and regulatory consequences and such an occurrence would be unacceptable to FEI, the public and its regulators. Gas pipeline ruptures can ignite due to causes ranging from a piece of metal blown from the ditch making contact with a rock, an external spark source (e.g. backhoe making contact with pipe), or static electricity resulting from the release. If the gas ignites, there can be significant safety impacts beyond the immediate area surrounding the pipeline.

[10] Transmission pipelines have an operating hoop stress of greater than or equal to 30% of the SMYS of the pipe, whereas distribution pipelines have an operating hoop stress less than 30%. FEI's operating pressure classifications of its system (e.g. Transmission Pressure (TP), Intermediate Pressure (IP), and Distribution Pressure (DP)), that have appeared in prior FEI submissions to the BCUC, are different from the operating stress-based classification that is applicable to this application. Some FEI TP assets are certified by the BC OGC to operate above 30 percent SMYS, while others are certified to operate below 30% SMYS.

[11] http://proceedings.asmedigitalcollection.asme.org/proceeding.aspx?articleid=1646086

Many of the 29 Transmission Laterals are single feed supply to many of the municipalities in the interior British Columbia regions collectively comprising approximately 167 thousand FEI customers. A pipeline rupture would result in loss of supply to end-use customers with economic consequences for residential, commercial and industrial customers. FEI estimates that an outage resulting from a rupture on the single feed laterals, depending on the severity, could range from weeks to months in order to repair, shutdown, purge the pipeline and relight customers. In addition, after the repairs have been completed, the lateral may be required to operate at a reduced pressure for a period of time until it is deemed acceptable to resume normal operating pressure.

It is expected that a rupture or a sudden and uncontrolled release of natural gas would be classified as a Level 2 Major or Level 3 Serious reportable incident by the OGC (Appendix D)[12]. The release of gas by rupture would result in major on-site equipment failure and hence would be considered a reportable incident under the Environmental Management Act Spill Reporting Regulation for transmission pipelines. The uncontrolled gas release could extend beyond the immediate area surrounding the pipeline, and potentially affect public safety, environment or property.

In alignment with the Canadian transmission pipeline industry, FEI and the BC OGC considers that a failure by rupture of its natural gas pipelines to be a significant incident and not acceptable performance within its integrity management program.

3.4 *STATUS QUO INTEGRITY MANAGEMENT SOLUTIONS FOR 29 TRANSMISSION LATERALS NO LONGER ACCEPTABLE OVER THE LONG TERM*

3.4.1 Existing Integrity Management Methods

FEI has a comprehensive Integrity Management Program (IMP) as required by the BC OGC. As part of the IMP, FEI's current strategy for detecting, assessing and monitoring the condition of its transmission pipelines relies primarily on the following two methods:

1. ILI – This method includes the insertion of a data collection device (commonly and variously referred to as an ILI tool, smart tool or pig) inside an operating pipeline to obtain indirect measurement and locations of imperfections such as metal loss, dents, and mechanical damage that may adversely affect the pipeline.[13] The ILI process steps are described in more detail in Appendix E; and

[12] Also available online at: https://www.bcogc.ca/incident-classification-matrix

[13] Different ILI technologies and distinct ILI tools exist in the marketplace for the detection and sizing of various pipeline imperfections, with differing performance specifications (e.g. accuracy) and requiring different system configuration (e.g. physical characteristics of the pipeline) and/or operational requirements (e.g. flow rate). FEI's selection of an ILI tool for use in its system depends on factors such as the stage of development of the tool and demonstrated effectiveness of the technology, the availability of a particular type of technology or tool for particular pipeline sizes (i.e. diameters), and the design and operational characteristics of the pipeline itself.

2. Modified ECDA – This method employs above-ground CP surveys and coating evaluations, supplemented with integrity digs where warranted to evaluate asset condition.

ILI is currently performed on mainline pipeline segments of NPS 8 (219 mm OD) and greater, and on Vancouver Island laterals of NPS 6 (168 mm OD) or greater. FEI's remaining transmission pipelines are monitored by Modified ECDA.

3.4.2 Limitations of ECDA Methods

Modified ECDA and ECDA are not capable of detecting corrosion in areas of CP shielding.[14] As discussed above, FEI's ILI activity has provided evidence of CP shielding on its pipeline system, which can lead to corrosion that would be undetected by ECDA methods. Modified ECDA and ECDA both involve the completion of above-ground surveys that rely on the detection and measurement of a signal (electrical current) discharging from the pipe surface. CP shielding not only prevents CP current from reaching the steel pipe surface, but also prevents the above-ground survey signal (current) from leaving the pipe. Therefore, no signal can be received and measured at the surface above the pipeline. The NACE Standard Test Method, "Aboveground Survey Techniques for the Evaluation of Underground Pipeline Coating Condition" (NACE Standard TM0109-2009, Item No. 21254) states:

> None of the aboveground coating evaluation techniques included in this standard are capable of detecting pipeline steel that is electrically shielded from the bulk electrolyte by disbonded coatings with no electrically continuous path to the electrolyte.

Consequently, if FEI was to continue only with Modified ECDA integrity management activities, FEI anticipates that CP shielding would result in corrosion sites remaining unidentified and therefore unmitigated.

Alternate integrity management strategies, including ILI, pressure regulation, and pipe replacement, are available for mitigating the potential for rupture that exists for transmission pipelines. Given the ineffectiveness of ECDA or Modified ECDA on a pipeline system with CP shielding, and the availability of other methods, FEI needs to assess other acceptable integrity management strategies.

3.4.3 Need to Assess Other Integrity Management Solutions

Given FEI's observation of corrosion on cathodically-protected pipe on its system and the limitations of Modified ECDA in detecting corrosion imperfections, FEI needs to assess and employ other integrity management solutions that will provide FEI the ability to mitigate the potential for rupture due to corrosion on the 29 Transmission Laterals.

[14] Disbonded coatings, large rocks, or foreign structures are examples of situations where CP shielding can occur.

As stated previously, FEI is required by the BC OGC to have an integrity management program. Through legislation, this integrity management program must address the life cycle of the pipeline system and be compliant with the CSA Z662-15, Section 3.2 and Annex N. Section 10.3 of CSA Z662-15 specifies that the integrity management program must include procedures to monitor for conditions that can lead to failures, to eliminate or mitigate such conditions, and to manage integrity data.

The BC OGC's expectations for transmission pipeline performance are defined in the *Oil and Gas Commission Activities Act* (OGAA) requirement to prevent all releases of product from operating pipelines. Section 37 (1) (a) of the OGAA states, "A permit holder, an authorization holder and a person carrying out an oil and gas activity must prevent spillage".[15]

The IGU Project is an appropriate, proactive response to FEI's obligations under the OGAA, with consideration to cost effectiveness in addition to a solution's ability to prevent ruptures, prevent leaks, and provide data for proactive lifecycle asset management decisions.

3.4.4 Emergence of ILI and Other Strategies for Integrity Management

In this section, FEI explains how its integrity management practices have improved over time and, specifically, how ILI has come to be common practice for managing transmission pipelines.

FEI's integrity management practices have improved over time in accordance with standards and regulations, and in consideration of industry practices and the Company's own assessment of lifecycle integrity management strategies. Examples of safety-driven activities that have existed since or near the time of original pipeline construction include pipeline patrols, CP management, leak management, and maintenance programs.

3.4.4.1 FEI's Integrity Management Program

As described in Section 3.4.3, FEI is required to have a pipeline integrity management program that addresses the life cycle of the pipeline system and includes procedures to assess and mitigate conditions that could lead to failures.

FEI's current integrity management activities are implemented and reviewed as part of a comprehensive single management system that systematically addresses all hazards that can affect the integrity of the pipeline system. The management system is known as the Integrity Management Program – Pipeline (IMP-P).

The hazard groups included within the IMP-P are as follows:

- Third party damage;
- Natural hazards, which includes potential geotechnical, hydrotechnical and seismic issues;

[15] Also available online at: at http://www.bclaws.ca/Recon/document/ID/freeside/00_08036_01

- Pipe condition, which includes the time-dependent hazards of external corrosion and stress corrosion cracking;
- Material defects and equipment failures; and
- Human factors.

3.4.4.2 Evolution of Integrity Management Technology and Activities

Although hazard management activities have evolved over FEI's operating history for all of the above listed hazards, external corrosion and stress corrosion cracking (SCC) management have been particularly influenced by the development of technology. Technological advancement has enabled operators to incorporate ILI as a common transmission pipeline integrity management activity today.

FEI first employed ILI technology in 1988 in selected mainline segments of the ITS. At that time, ILI tools provided much lower resolution data than is possible today and were available for only a limited range of pipeline diameters. By the early 2000s, higher resolution tools were becoming available and industry practice had evolved such that ILI was a widely-adopted operating practice for transmission pipeline operators. FEI expanded its ILI program during this period through a five-year program to retrofit its Coastal Transmission System mainline pipelines for ILI. This retrofit program and other supporting integrity management activities were referred to as the Transmission Pipeline Integrity Program (TPIP).

In more recent years, and in alignment with other Canadian transmission pipeline operators, FEI's ILI practice has changed in the following areas:

- FEI has adopted new or improved ILI technologies to enhance capabilities with respect to imperfection detection and sizing;
- FEI has increased ILI frequency to provide increased statistical confidence in data analyses; and
- FEI has increased the numbers of pipelines subject to ILI, in part due to the commercialization of ILI tools over an expanding range of pipeline diameters, pipeline configurations and operating pressures.

ILI provides effective integrity verification, as it enables an operator to identify imperfections such as corrosion, and to focus pipeline rehabilitation efforts to specific locations. ILI data collection occurs on a recurring cycle (typically 5 to 7 years), thereby providing an indication of potential degradation of a pipeline that may warrant mitigation (e.g. to prevent possible leaks) or eventual replacement. Intervention can be applied proactively (i.e. prior to failure), providing the operator with additional planning time for a response versus other more reactive integrity management strategies. Perhaps most importantly and as discussed in Section 3.3.2, due to the incidence of CP shielding on FEI's system, the implementation of ILI enables detection of

imperfections that would otherwise be expected to remain undetected and thereby unmitigated by either Modified ECDA or ECDA.

Other possible asset management benefits of ILI include:

- Provision of data indicating where ground movement has occurred, for the purposes of identifying potential geotechnical hazards;
- Provision of GPS coordinates, for pipeline location centreline mapping purposes; and
- Validation of records such as pipeline wall thickness and the presence of any appurtenances (such as tees, valves, etc.).

These are contributing factors for the increasing adoption of ILI by transmission pipeline operators.

Although not part of this Project, FEI is currently developing its strategy for adopting crack-detection capabilities through ILI. This work is proceeding as part of the Transmission Integrity Management Capabilities (TIMC) project, as described in FEI's Annual Review for 2019 Delivery Rates Application and responses to information requests. A quantitative risk assessment is underway for determining particular pipelines that will require modifications in order to accommodate EMAT tools[16], as well as their urgency and priority. FEI notes at this time that EMAT technology suitable for FEI's natural gas system is not yet available and/or commercialized for smaller diameter pipelines (e.g. less than NPS 12) and its development timeline is unknown. However, FEI's ILI retrofits will also be able to facilitate EMAT tool adoption if and when it is deemed necessary.

FEI is also continuing to assess the need for and feasibility of adopting robotic or self-propelled ILI tools in its pipeline system. This technology may prove useful and efficient for specific future applications.

In addition to ILI, FEI and industry have identified alternative approaches to achieving integrity management objectives. In some cases, these alternatives can be more feasible and/or more cost effective. Whereas ILI reduces the likelihood of a pipeline rupture by identifying and repairing imperfections prior to them reaching critical dimensions, it is also possible to mitigate the potential consequences associated with a transmission pipeline failure by reducing its operating stress level. Notably, installing pressure regulation facilities or replacing a pipeline can achieve a reduction of the pipeline hoop stress to below thirty percent of its SMYS, limiting the potential for pipeline failure to result in a rupture. With the operating stress reduced, these lateral pipelines would then be subject to pipe condition management activities suitable to the

[16] Crack-detection in-line inspection tools are commonly referred to as "EMAT tools" as the technology relies upon electro-magnetic acoustic transducers. EMAT is a non-destructive testing technology that has applications in a wide range of industrial sectors. EMAT is generally used to assess the condition of manufactured objects and the technology is particularly effective for detection of stress corrosion cracking and disbonded coating. The EMAT generates an ultrasonic pulse within a metallic and/or ferromagnetic test object. The sound waves are generated in the material and thus no couplant is needed.

reduced corrosion-related rupture potential (e.g. CP monitoring, leak survey, etc.). Hazards such as third-party damage and natural hazards, for which neither the likelihood nor consequences are mitigated through pressure regulation (as rupture could still be caused by either of these externally applied forces) would continue to be managed as they are today.

3.4.5 Industry Failure History and Regulatory Response

The IGU Project and the increase in the use of ILI are also driven in part by industry pipeline failure history and FEI's understanding of the experiences of its peer Canadian transmission pipeline operators. British Columbia pipeline failures are discussed in Section 3.3.1.

An example of Canadian industry failure history is contained within a NEB letter to TransCanada PipeLines Limited (TCPL) on March 5, 2014 as part of Order SG-N081-001-2014. The letter and order, is included as Appendix F[17], pertains to the portion of TransCanada PipeLines Ltd.'s pipeline system known as Nova Gas Transmission Ltd. (NGTL). Within the letter accompanying the order, the NEB states:

> The National Energy Board (NEB or the Board) recently released its audit of TransCanada Pipelines Ltd.'s (TransCanada) integrity management program. In the audit, the Board noted potential safety concerns for pipelines, specifically in the NGTL system, that either have not or cannot be inspected using in-line tools. Since the conclusion of the NEB's information gathering component of the audit in August of 2013, there have been three ruptures and four leaks on TransCanada's NGTL system. Those lines that have been returned to service are currently operating under a 20% pressure restriction.
>
> The Board is concerned by this recent trend of pipeline releases. In order to proactively promote public safety and protection of the environment, the Board orders TransCanada to reduce its maximum operating pressure on the unpiggable pipelines previously identified by TransCanada to have the highest risk. The Board's intention with these pressure reductions is to encourage the conditions necessary for the continued safe operation of this network of natural gas pipelines, while proactively reducing the risk of future ruptures.

As indicated in the quote above, the NEB in 2014 had identified a trend in pipeline releases, including three ruptures on the NGTL system, and expressed particular concern with pipelines that cannot be inspected using in-line tools. The NEB's immediate remedy for the issue in this particular case was to reduce the pressure of the pipelines. Through discussion with TransCanada employees, FEI is informally aware that NGTL laterals have subsequently been, and are continuing to be, retrofitted to enable ILI.

[17] Available online at: https://www.neb-one.gc.ca/sftnvrnmnt/cmplnc/rprts/brdlttrrdr/2014/SG-N081-001/sg-n081-001-eng.pdf.

3.5 *PROJECT JUSTIFICATION CONCLUSION*

The 29 Transmission Laterals do not have ILI capability and are operating at a hoop stress of 30 percent or more of the SMYS of the pipe and therefore have the potential to fail by rupture due to corrosion. Rupture of a transmission pipeline could have significant safety, reliability, environmental and regulatory consequences and such an occurrence would be unacceptable to FEI, the public and its regulators.

The leading cause of transmission pipeline failures in British Columbia is the deterioration of pipe condition caused by the time-dependent hazard of corrosion. FEI currently assesses the Transmission Laterals using Modified ECDA. However, FEI has encountered active corrosion on its system due to CP shielding, which cannot be detected by Modified ECDA. Modified ECDA is therefore no longer an acceptable means to manage the integrity of the 29 Transmission Laterals over the long term.

There are multiple strategies available for operators to mitigate the potential for rupture on transmission pipelines due to corrosion. The Project is proposing several alternatives to the status quo, including ILI and other cost effective solutions, including installation of pressure regulation facilities or replacement of the pipeline that will provide for continued safe and reliable long-term operation of these lines. The Project, completed proactively over a reasonable planning horizon and in consideration of the feasibility and benefits of alternate integrity management strategies, demonstrates FEI's commitment to continual improvement within its integrity management program, and is an appropriate response to the potential for rupture failure due to corrosion.

4. DESCRIPTION AND EVALUATION OF ALTERNATIVES

4.1 *INTRODUCTION*

FEI analysed 7 alternative integrity management solutions that could meet the Project's objective to mitigate the potential for rupture failure due to corrosion on the 29 Transmission Laterals.

These are:

1. Status Quo: Modified External Corrosion Direct Assessment (Modified ECDA);
2. Pipeline exposure and re-coat (PLE);
3. Hydrostatic testing program (HSTP);
4. Pressure regulating station (PRS);
5. In-line inspection (ILI);
6. Pipeline replacement (PLR); and
7. Robotic Inspection (ROB).

FEI evaluated the alternatives using a weighted scoring system based on three criteria: (1) Integrity and Asset Management Capability; (2) Project Execution and Lifecycle Operation; and (3) Financial. The alternative with the highest evaluated score was selected, except in cases where the scoring system produced similar results or where the highest scoring alternative was not the lowest cost, in which case FEI used subject matter experts to validate the scores and select a preferred alternative.

The status quo alternative was rejected because it does not meet the Project's objective of mitigating the potential for rupture failure due to corrosion. FEI rejected ROB as it is not considered proven and commercialized at this time. FEI also rejected the PLE and HSTP alternatives as not feasible due to a combination of lack of integrity management benefits, higher cost, and the disruption of service to customers. For some laterals, PRS was rejected in favour of other alternatives due to capacity limitations of some systems. In some cases, PLR was rejected in favor of other alternatives when the laterals were longer than 4.0 kilometres due to higher cost.

The results of the analysis of the remaining three feasible alternatives are summarized as follows:

- **PRS Chosen Where Viable:** Where PRS was viable, it was chosen as the preferred alternative for all laterals except for one because it met the objective of the Project at the lowest cost and rate impact, and with limited ground disturbance and public impacts. The installation of a PRS was not viable for some laterals due to capacity limitations, which would cause the PRS to impact existing firm customers or interruptible customer

operations or prevent new additions of new customers to the lateral. In the one case where PRS was viable but not selected as the preferred alternative, PLR was chosen because it had a higher overall score, was financially comparable and offered better integrity and asset management capability benefits.

- **ILI More Cost Effective for Longer Laterals:** Where PRS was not viable, ILI was selected for longer laterals due to a lower cost and rate impact, and better proactive asset management capability. For the longer laterals, PLR had a much higher capital Project cost and resulted in a higher rate impact when compared to ILI for the same lateral.
- **PLR for Shorter Laterals:** For the shorter laterals, PLR was selected as the preferred alternative for all cases except for one because it met the objective of the Project at the lowest cost and rate impact. For the case where PLR was not selected, PRS was selected because it has a lower capital cost and resulted in minimal ground disturbance.

The remainder of this section describes FEI's alternatives analysis in more detail including a description of each of the alternatives, the evaluation criteria and methodology, the screening process, and the alternatives analysis for each of the 29 Transmission Laterals.

4.2 *ALTERNATIVES DESCRIPTION*

FEI considered seven alternatives for evaluation that are available to pipeline operators to mitigate the potential for rupture due to corrosion and that have been applied with varying frequency by Canadian pipeline operators. These are:

1. Status Quo: Modified External Corrosion Direct Assessment (Modified ECDA);
2. Pipeline exposure and re-coat (PLE);
3. Hydrostatic testing program (HSTP);
4. Pressure regulating station (PRS);
5. In-line inspection (ILI);
6. Pipeline replacement (PLR); and
7. Robotic Inspection (ROB).

4.2.1 Status Quo: Modified ECDA Alternative

This alternative involves continued use of Modified ECDA to mitigate the potential for failure due to corrosion. ECDA is a process for managing external corrosion, published as standard ANSI/NACE SP0502-2010 "Standard Practice Pipeline External Corrosion Direct Assessment Methodology" (Appendix G).[18]

[18] Available online at: https://www.nace.org/uploadedFiles/Corrosion_Central/Industries/SP050208PHMSA.pdf.

An ECDA is completed in four steps:

- **Pre-assessment** – collection and consideration of pipeline information (e.g. construction, operation, operating environment, and other relevant factors) to establish the applicability of this methodology for each segment of the pipeline, and to determine indirect inspection methods to be applied in the next step;
- **Indirect Inspection** – implementation of various surveys from the ground surface above a buried pipeline. Except where CP shielding is occurring, above-ground surveys can provide information on coating imperfections[19] and areas of potential corrosion activity (i.e. where CP may not meet the required level);
- **Direct Examination** – Data obtained during the pre-assessment and indirect inspection is analyzed, and dig sites are selected. The pipeline is exposed at selected sites for detailed inspection. The ECDA methodology also defines prescriptive requirements for control digs at random sites to verify the validity and applicability of the methodology to each segment of the pipeline. Further, there are prescriptive requirements to perform supplementary digs where the information obtained from indirect inspections do not align with the results from direct examinations. Pipeline repair and/or recoat is performed on an as needed basis; and
- **Post Assessment** – Data from all preceding steps is analyzed to confirm that the objectives have been met, to establish any further investigation to confirm pipe integrity, and to establish a re-inspection interval.

Within its Integrity Management Program – Pipelines (IMP-P), FEI's internal standard titled the "IMP-P: Time-Dependent Threat Management of Non-Piggable Pipelines" (Appendices H-1 and H-2) contains a modified version of the ANSI/NACE ECDA standard practice and is referred to as Modified ECDA. FEI's internal standard is based on its prior experience and is consistent with industry practice in Canada. Undertaking Modified ECDA as part of its integrity management program allows FEI to identify potential coating imperfections and CP system issues, and to mitigate the potential for external corrosion (albeit with limitations, as discussed in Section 3.4.2). The primary difference between FEI's Modified ECDA and the ANSI/NACE ECDA is with respect to the determination of the required number of excavations. ECDA requires control digs where there has been no indication of potential corrosion from the above-ground surveys and requires supplementary digs where the information obtained from indirect inspections does not align with the results from direct examinations. FEI's Modified ECDA approach, instead, is less prescriptive and allows for variation in the number of digs performed based on FEI's assessment of the value of the dig.

As described in more detail in Section 3.4.2, Modified ECDA and ECDA are not capable of detecting corrosion in areas of CP shielding due to technical limitations of ECDA methods.

[19] Coating imperfections or holidays are areas where coating may be missing, degraded, or damaged. Commonly referred to as "coating holidays".

However, Modified ECDA remains an integrity management tool available to FEI which will continue to be used by FEI where appropriate.

4.2.2 Pipeline Exposure and Re-Coat (PLE) Alternative

This alternative involves exposing the entire length of a pipeline, performing a detailed inspection of the pipeline surface and assessing any imperfections, conducting required pipeline repairs, and completing a recoat of the entire pipe surface. The full length of the pipeline would then be re-buried and subject to site rehabilitation and future Modified ECDA. Large-scale in-ditch recoating of pipelines is a complex undertaking, and is not typically performed by operators due to high costs relative to other available solutions.

4.2.3 Hydrostatic Testing Program (HSTP) Alternative

A hydrostatic testing program to verify the integrity of a transmission pipeline over its lifecycle involves periodically taking the pipeline out of service and subjecting it to a hydrostatic test (i.e. filling the line with water to a pressure above the expected maximum operating pressure). In the event of a failed test (i.e. loss of pressure during the test), the leaking section(s) of pipe would need to be located, excavated, cut-out and replaced, and then the entire test section subjected to a subsequent hydrostatic test. As the pipeline is required to be out of service for a period of at least a week to implement this alternative, on an estimated recurring frequency of between 5 to 10 years, it would typically only be considered applicable for pipelines that are looped or where customers could be temporarily supplied by an alternate energy source such as liquefied natural gas (LNG) or compressed natural gas (CNG).

4.2.4 Pressure Regulating Station (PRS) Alternative

This alternative involves installation of a pressure regulating station to lower the operating stress of a pipeline to below 30% SMYS. When operating at reduced stress levels, it is generally accepted that pipeline failures due to pressure-dependent hazards (e.g. corrosion) will have the potential to leak rather than rupture, significantly reducing the potential consequences of failure. The PRS alternative also has the smallest ground disturbance footprint of all the alternatives given that the impact would be limited to the station site itself, ultimately reducing potential impact to the environment, Indigenous communities and stakeholders.

PRS is not feasible for all laterals. Laterals determined to have insufficient capacity to meet the forecasted demand of current and future customers when pressure is regulated to below 30% SMYS are not suitable for PRS. Feasibility of PRS for each lateral is discussed in Section 4.4.3.

4.2.5 In-Line Inspection (ILI) Alternative

ILI involves the insertion of a data collection device (commonly referred to as an ILI tool or pig) inside an operating pipeline to obtain indirect measurement of imperfections (e.g. metal loss, dents, and mechanical damage) that may adversely affect its integrity.

The ILI alternative requires retrofitting an existing pipeline to accommodate its inspection by removing any obstructions that may impede the clear passage of the ILI tool. Launcher and receiver barrels are also required to be installed for the loading and unloading of tools.

While new transmission pipelines would be constructed with ILI capability, the 29 Transmission Laterals were not and have various obstructions such as:

- Reduced-port valves;
- Bends with a radius of curvature less than or equal to 1.5 times the outer diameter of the pipeline;
- Unbarred tees; and
- Wall thickness transitions (variations) as described in Section 5.2.1.6.

Under the ILI alternative, FEI would install a launcher and receiver barrel and associated valves and piping and would remove obstructions to enable ILI. Following the retrofit, FEI would verify that obstructions were removed by using a gauge plate or simple caliper tool.

ILI data collection occurs on a recurring cycle (typically 5 to 7 years). For the purposes of this application, including lifecycle cost estimates, FEI has estimated a seven-year re-inspection cycle. A detailed description of FEI's ILI process is included within Appendix E.

ILI is highly regarded by operators as the data enables rehabilitation efforts to be focused on specific locations. ILI also enables proactive asset management by providing pipeline wall condition data (including changes over time) that can inform long-term asset planning.

4.2.6 Pipeline Replacement (PLR) Alternative

This alternative involves replacing the existing pipeline with a new pipeline constructed to current standards of design (including accommodations for future ILI capability with limited retrofits, e.g., installation of launcher and receiver barrels), material selection, and construction. This option also allows for corrosion-related rupture potential to be mitigated by designing the pipe with an operating stress of less than 30 percent SMYS. When operating at reduced stress levels, it is generally accepted that pipeline failures due to pressure-dependent hazards (e.g., corrosion) will have the potential to leak rather than rupture, significantly reducing the potential consequences of failure. Lifecycle pipe condition management activities for a reduced operating stress pipeline could be modified to levels suitable to the reduced corrosion-related rupture potential. Hazards such as third-party damage and natural hazards would continue to be managed as they are today, as the externally applied forces from these hazards could still cause a pipeline rupture.

As pipeline replacement would involve disturbing the ground within FEI's ROW to install the new pipe, there could be more disruption to Indigenous communities and surrounding landowners and other stakeholders compared to other alternatives. In addition, the original pipeline will need

to remain in-service until the installation of the replacement pipeline is completed and as a result, there will be requirements for land acquisition for construction and working space.

4.2.7 Robotic Inspection (ROB) Alternative

This alternative involves the use of robotic ILI tools that are self-propelled and can be inserted into pipelines through stopple fittings. ROB is similar to ILI in its method of detecting and sizing corrosion imperfections, but differs in the way that the tool traverses through the pipeline. ROB tools are self-propelled (i.e., through use of rechargeable batteries) as opposed to relying on gas flow to achieve the required tool travel speed within the pipeline. The batteries require recharging approximately every 450 metres. In order to perform the recharging, fittings would need to be installed on the pipeline at 450 metre intervals. Furthermore, each time the tool is run, the fittings at the designated charging points would have to be excavated in order to be accessible for the recharging activity.

Potential advantages of this method are the ability to traverse through lines with insufficient flow to propel an ILI tool, and the lack of reliance on above-grade launcher and receiver barrels. Current challenges associated with ROB tools are their lack of availability for pipe sizes of NPS 6 (168mm) and smaller, their degree of commercialization (FEI is aware of only a single vendor providing this service for pipe sizes larger than NPS 6), and their requirement for frequent charging.

4.3 *ALTERNATIVES EVALUATION METHODOLOGY*

All identified alternatives were considered for each of the 29 Transmission Laterals. FEI applied a weighted-scoring methodology to evaluate the performance of each alternative in relation to three sets of evaluation criteria. In some cases, where the laterals and loops were physically interconnected with crossover connections and are operated as a system, the selected alternative was evaluated for compatibility with the whole system. In addition to the weighted-score computed for each alternative, FEI internal subject matter experts validated the highest scoring alternative for each lateral. The components of the evaluation methodology are described in the subsections below.

4.3.1 Evaluation Criteria

As described in more detail below, the following evaluation criteria was used to evaluate the alternatives:

1. Integrity and Asset Management Capability:
    a. Prevention of Ruptures;
    b. Prevention of Leaks;
    c. Proactive Asset Management; and
    d. Technical Certainty.

2. Project Execution and Lifecycle Operation:
    a. Environmental;
    b. Lands & ROW;
    c. Consultation and Engagement Complexity;
    d. Operational Complexity;
    e. System Capacity & Customer Impacts; and
    f. Project Execution Certainty.
3. Financial:
    a. Present Value (PV) of Incremental Annual Revenue Requirement (over 66 years).

Each criterion is described in the sections below.

4.3.1.1 Integrity and Asset Management Capability

The 7 alternatives do not provide equivalent capabilities to FEI in meeting its objective of mitigating the potential for rupture failure due to corrosion, or technical considerations of preventing leaks and providing capability for proactive asset management. To avoid a potential scenario of selecting an alternative that may not enable FEI to meet its technical objectives, FEI weighted Integrity and Asset Management Capability above other criteria.

The factors evaluated within this category are as follows:

- **Prevention of ruptures:** ability of an alternative to mitigate the potential for transmission pipeline ruptures due to external corrosion and the potential consequences of a natural gas transmission pipeline rupture as discussed in Section 3.3.3. This criterion reflects the objective of the Project and thus was given the highest weighting. The score reflects the degree to which the potential for pipeline rupture has been mitigated. If an insufficient improvement can be obtained over status quo by a given alternative, it may be screened out on a technical basis.
- **Prevention of leaks:** ability of an alternative to prevent leaks due to external corrosion. In consideration of its obligation to prevent spillage under the OGAA, FEI scored alternatives that can prevent the occurrence of leaks on the transmission pipeline system higher than those that do not provide this capability.
- **Proactive asset management:** ability of an alternative to enable proactive repair/replace decisions based on asset condition over the lifecycle of the asset, and to provide data for other asset management processes (e.g. ground movement, centreline mapping, validation of records). The ability to proactively manage assets allows potential hazards to be addressed before failures occur.

- **Technical certainty:** confidence that a selected alternative will provide its integrity and asset management capabilities long term, without needing to revert to another alternative.

4.3.1.2 Project Execution and Lifecycle Operation

The six alternatives considered for the Project do not provide equivalent capabilities to FEI with respect to efficient and effective project execution and/or lifecycle operation. FEI considered an analysis period of 66 years in its assessment which includes six years during the Project from 2019 to 2024 for Project execution and 60 years post-Project for lifecycle operation[20]. The criteria utilized to assess Project execution and lifecycle operations were as follows:

- Environmental: estimated complexity associated with the Project and continued operation with respect to environmental factors such as permitting, management of waste and/or contamination, and impacts to the surrounding environment (e.g. vegetation, soil, watercourses);
- Lands & Right-of-Way: estimated complexity associated with various lands-related factors such as acquisition of temporary and/or permanent land rights as well as lifecycle impacts (e.g. management of encroachments, annual rent payments);
- Consultation and Engagement: estimated complexity with engaging Indigenous communities and stakeholders such as municipalities, Ministry of Transportation and Infrastructure (MoTI), BC Hydro, and others regarding the Project including potential expectations with respect to community benefit and/or investment;
- Operational: estimated complexity in operating the selected Project alternative considering factors such as internal/external resources required, equipment and tools needed, potential level(s) of safety hazard exposure over the lifecycle, and the degree of maintenance or enhancement possible with respect to maintenance flexibility (e.g. operational windows to execute work);
- System Capacity & Customer Impacts: an estimate of the degree to which selection of a particular alternative might impact FEI's current ability to meet future capacity growth needs or to provide reliable gas service to customers (e.g. supply interruption); and
- Project Execution: an estimate of the degree to which selection of a particular alternative might impact such items as regulatory permitting, timeline/schedule, budget certainty, scope certainty, environmental and archaeological impacts, geotechnical conditions and various constructability considerations (including resources).

[20] The 60-year post-project analysis period was chosen based on the currently approved depreciation rate of Transmission Main pipeline at 1.47% (or 68 years) since the majority of the capital expenditures are tracked under the Transmission Main pipeline asset. The analysis period post-project was rounded down to 60 years for simplicity and considering that it covered approximately 90 percent of the depreciation life of a Transmission Main pipeline.

4.3.1.3 Financial

FEI considered the long term rate impact to FEI's non-bypass customers to financially compare all remaining feasible alternatives. This was completed by evaluating the present value of the incremental revenue requirement as well as the levelized delivery rate impact over the 66-year analysis period for each alternative based on the estimated capital cost and operating cost. For a fair comparison, future incremental sustainment capital and operating expenditures over the 66-year analysis period for each alternative was included. For example:

- For PRS and ILI, the replacement costs or sustainment expenditures, if any, for the measuring and regulating equipment, the building or enclosed structure for housing the measuring and regulating equipment, and the telemetry equipment for which the life of the assets are estimated over approximately 41 years, 43 years, and 10 years, respectively[21];
- For ILI, the future sustainment expenditures for ILI re-inspection and integrity digs as a result of each ILI re-inspection[22]. ILI re-inspection was assumed to occur on a 7-year cycle;
- For PRS, the future O&M expenditures for maintaining the new PRS stations; and
- For PLR, there is no incremental future capital for replacement as the average life of a new transmission main pipeline is estimated to be 68 years[23] and no incremental O&M expenditures (i.e. no increase in O&M costs compared to the O&M costs for the existing pipeline).

4.3.2 Scoring and Weighting

Each of the criteria were scored for each of the 29 Transmission Laterals on a range from 0-5:

- 0 No cost estimate was prepared for this alternative if it is technically not feasible or it is screened out on a technical and cost basis as discussed in Section 4.4 below
- 1 The alternative is over 100 percent higher than the alternative with the lowest PV of incremental revenue requirement (66 years)
- 2 The alternative is 50 percent to 100 percent higher than the alternative with the lowest PV of incremental revenue requirement (66 years)

[21] The currently approved depreciation rate for transmission measuring & regulating equipment is 2.41 percent (41.5 years), for transmission measuring and regulating structure is 2.29% (43.7 years) and for transmission telemetering is 9.75 percent (10.3 years).

[22] The capital cost of a single ILI cleaning run (i.e. the first ILI run after the project is commissioned) is estimated to be $480 thousand, in 2018 dollars, for laterals that are over 6.0 kilometres long and $440 thousand, in 2018 dollars, for laterals that are less than 6.0 kilometres long. For subsequent single ILI re-inspection run, the capital cost is estimated to be $333 thousand per re-inspection in 2018 dollars. The re-inspection is to occur on a 7-year cycle. The resulting integrity dig is estimated to be $35 thousand per dig, in 2018 dollars with 80 percent capitalized and 20 percent O&M primarily for administrative overhead costs (training, etc). All costs are estimated based on historical data.

[23] The currently approved depreciation rate for transmission main is 1.47 percent (68.0 years).

- 3 The alternative is 20 percent to 50 percent higher than the alternative with the lower PV of incremental revenue requirement (66 years)
- 4 The alternative is 5 percent to 20 percent higher than the alternative with the lowest PV of incremental revenue requirement (66 years)
- 5 The alternative with the lowest PV of incremental revenue requirement (66 years) and those alternatives that are within 5 percent of the alternative with the lowest PV of incremental revenue requirement (66 years)

The scoring system for the financial evaluation was designed to compare the PV of the incremental revenue requirement relative to the alternative with the lowest PV of incremental revenue requirement. For instance, the alternative with its PV of incremental revenue requirement (or rate impact) only 5 percent higher than the alternative with the lowest PV of incremental revenue requirement was not given the same weighting as the alternative with a PV of incremental revenue requirement that is over 100 percent higher than the alternative with the lowest PV of incremental revenue requirement.

The following tables show the weightings applied when scoring the alternatives.

Table 4-1: Overall Weighting of Evaluation Criteria

Evaluation Criteria	Weight
Integrity and Asset Management Capabilities	45%
Project Execution & Lifecycle Operation	20%
Financial	35%

Table 4-2: Weightings within Integrity and Asset Management Capabilities

Integrity and Asset Management Capabilities	Weight
Prevention of Ruptures	45%
Prevention of Leaks	10%
Proactive Asset Management	25%
Technical Certainty	20%

Table 4-3: Weightings within Project Execution & Lifecycle Operation

Project Execution & Lifecycle Operation	Weight
Environmental	15%
Lands & ROW	15%
Consultation and Engagement Complexity	15%

Project Execution & Lifecycle Operation	Weight
Operational Complexity	25%
System Capacity & Customer Impacts	20%
Project Execution Certainty	10%

Table 4-4: Weighting within Financial

Financial	Weight
PV of Incremental Annual Revenue Requirement (66 years)	100%

4.3.3 Subject Matter Review

FEI's internal subject matter experts met to review and determine the preferred alternative for each lateral where alternative scores were close. Subject matter experts considered the following in their determination of a Preferred Alternative:

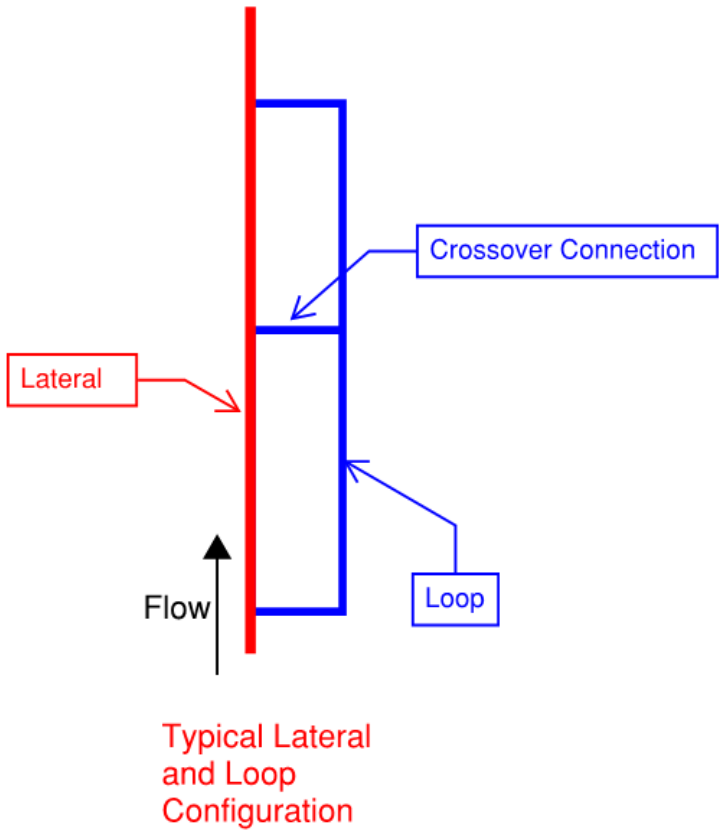
- Site-specific knowledge of pipeline operating environment, and in particular its influence on Project Execution & Lifecycle Operation; and
- The extent of the differences between each alternative in terms of the PV of incremental revenue requirement in comparison to the degree of difficulty between each alternative in terms of the nature of work required in construction on a lateral by lateral basis.

This is further described in the detailed evaluation of each lateral in Appendix I.

4.3.4 Treatment of Interconnected Laterals as a System

In some cases, as shown in Figure 4-1 below, the laterals and their corresponding loops are physically joined with crossover connections and are operated as a system. This means that a selection of an alternative for one lateral must also be an acceptable solution for the other laterals (loops) connected in the system. For example, if the PRS alternative is technically feasible for a lateral, but it isn't compatible with other laterals that interconnect with looping and crossovers (because they require a lower pressure regulation set point to achieve less than 30 percent SMYS that then impacts customer delivery), then the PRS would not be selected as a feasible alternative.

Figure 4-1: Visual Representation of Interconnected Laterals Treated as a System



4.4 ALTERNATIVES SCREENED OUT BASED ON TECHNICAL AND FINANCIAL CRITERIA

FEI first evaluated the technical merits of the alternatives to screen out those that did not accomplish the objective of the Project to mitigate the potential for rupture due to corrosion. FEI then considered whether the alternatives were proven and commercialized, other technical criteria such as Project execution and lifecycle operation factors, and high level cost estimates to determine alternatives should be screened out. The outcome of this screening process is described in the subsections below.

4.4.1 Status Quo: Modified ECDA Screened Out Based on Inability to Achieve Project Objective

Where CP shielding is occurring, Modified ECDA will not detect sites that may be experiencing active corrosion. FEI's inspection of its system has shown that active corrosion has occurred on cathodically-protected pipe due to CP shielding. As such, FEI does not consider this method to be an acceptable means to manage the potential for corrosion-related rupture to the 29 Transmission Laterals over the long term. This alternative does not achieve the primary objective of the Project which is to mitigate the potential for rupture due to corrosion.

Status Quo was screened out on a technical basis and was not considered further in the evaluation process.

4.4.2 Robotic Inspection (ROB) Screened Out Based on Readiness

At this time, FEI does not consider robotic ILI tools to be proven and commercialized. The technology is not available for pipe sizes of NPS 6 (168mm) and FEI is only aware of a single vendor providing this service for larger pipe sizes. As described in Section 4.2.7, the batteries require recharging approximately every 450 metres. The required excavations at each recharge point each and every time the robotic tool is run is not desirable from a lifecycle operation perspective in terms of impact to the environment, Indigenous communities, and stakeholders.

As a result, the ROB alternative was screened out as not feasible and was not considered further in the evaluation process.

4.4.3 Pressure Regulating Station (PRS) Screened Out for Some Laterals Based on Capacity Limitations

PRS was not viable for some laterals due to capacity limitations of some systems. By reducing the operating pressure of the pipeline, the capacity available to customers will change. Laterals where a PRS would impact existing firm customers or interruptible customer operations or prevent new additions of new customers to the lateral were not considered candidates for the PRS alternative. Below in Table 4-5 are the 29 Transmission Laterals and their PRS feasibility.

Table 4-5: Feasibility of PRS for the 29 Transmission Laterals

Line/Loop Full Name	PRS Feasibility
Mackenzie Lateral 168	Not Feasible
Mackenzie Loop 168	Not Feasible
BC Forest Products Lateral 168	Feasible
Prince George 3 Lateral 219	Feasible
Northwood Pulp Lateral 168	Feasible
Northwood Pulp Loop 219	Feasible
Prince George 1 Lateral 168	Not Feasible
Prince George Pulp Lateral 168	Feasible
Husky Oil Lateral 168	Feasible
Prince George 2 Lateral 219	Feasible
Cariboo Pulp Lateral 168	Feasible
Williams Lake Loop 1 and 2 168	Feasible
Kamloops 1 Lateral/Loop 168	Not Feasible
Salmon Arm Loop 168	Not Feasible
Salmon Arm 3 Lateral 168	Not Feasible

Line/Loop Full Name	PRS Feasibility
Coldstream Lateral 219	Feasible
Coldstream Loop 168	Feasible
Kelowna 1 Loop 219	Feasible
Celgar Lateral 168	Feasible
Castlegar Nelson 168	Feasible
Trail Lateral 168	Feasible
Fording Lateral 219/168	Not Feasible
Elkview Lateral 168	Feasible
Cranbrook Lateral 168	Not Feasible
Cranbrook Loop 219	Not Feasible
Cranbrook Kimberley Loop 219	Not Feasible
Cranbrook Kimberley Loop 273	Not Feasible
Kimberley Lateral 168	Not Feasible
Skookumchuck Lateral 219	Not Feasible

As a result, the PRS alternative was screened out for the laterals where there are capacity limitations and was not considered further in the evaluation process for those laterals.

4.4.4 Technical Comparison of Remaining Alternatives

The following table provides an overview of FEI's assessment of the remaining alternatives against the technical criteria of Integrity and Asset Management Capabilities and Project Execution & Lifecycle Operation. Combined, this technical criterion comprises 65 percent of the alternatives total score. ILI is the only alternative that has been assessed as providing superior integrity management capabilities. While alternatives 4 (PRS) and 6 (PLR) generally provide acceptable integrity management capabilities, they were superior in the Project execution and lifecycle operation scoring where PLE and HSTP alternatives provided acceptable but inferior technical scores when compared to the other alternatives as described in Sections 4.4.4.1 and 4.4.4.2. ILI, PLR and PRS were evaluated to be technically superior to the other alternatives, with ILI providing the highest technical rating out of all of the alternatives[24].

[24] Detailed technical scores for ILI, PRS and PLR are provided in appendix I.

Table 4-6: High Level Technical Evaluation of Alternatives

	Integrity and Asset Management Capabilities				Project Execution and Lifecycle Operation*						
Alternative	Prevention of Ruptures	Prevention of Leaks	Proactive Asset Management Capability	Technical Certainty	Consultation and Engagement Complexity	Environmental	Lands & ROW	Operational Complexity	Project Execution Certainty	System Capacity & Customer Impacts	**High-level Performance Evaluation of Alternative**
PLE	▲	▼	—	▲	▼	▼	▼	▼	▼	▲	—
HSTP	▲	▼	▼	—	▼	▼	▼	▼	▼	▼	—
PRS	▲	▼	▼	—	—	▲	▲	▲	▲	▼	▲
ILI	▲	▲	▲	▲	▼	—	—	—	—	▲	▲
PLR	▲	—	—	▲	▼	▼	▼	▲	—	▲	▲

** The Project Execution and Lifecycle Operation scores will vary depending on the lateral, but these scores are a high level representation of how each alternative impacts each category*

Legend

▼	Inferior alternative
—	Acceptable alternative
▲	Superior alternative

4.4.4.1 Pipeline Exposure and Re-coat (PLE)

As summarized in Table 4-5 above, the PLE alternative provides a high confidence method of assessing the pipeline condition. By exposing the pipe, making necessary repairs, applying a modern coating and utilizing Modified ECDA, the PLE alternative achieves the technical objective of preventing rupture with high confidence and achieves the additional technical consideration of preventing leaks.

However, PLE would not allow FEI to forecast future pipe condition, as it would with a method such as ILI; therefore, PLE rated lower for proactive asset management. PLE also rated the lowest for Project execution and lifecycle due to complex Project execution and larger impact to the environment, Indigenous communities and stakeholders as a result of the need to excavate the entire length of the lateral. Furthermore, the exposure of the full length of the pipeline for a detailed inspection, recoating and making any necessary repairs is a significant and complex undertaking not commonly employed by transmission pipeline operators.

4.4.4.2 Hydrostatic Testing Program (HSTP)

The Hydrostatic Test Program achieves the objective of preventing rupture by subjecting the lateral to a pressure test. While this alternative is capable of identifying critical defects through the destructive nature of hydrostatic testing, it cannot identify defects that have potential to fail. Without pipe condition data, HSTP does not provide any leak prevention capability. Moreover, without pipe condition data to predict failure in between the hydrostatic test intervals (an estimated recurring frequency of between 5 to 10 years), this alternative does not provide any capability of proactive asset management.

Although hydrostatic testing is a necessary and useful integrity verification method for newly constructed pipelines, hydrostatic testing is a less commonly adopted solution for ongoing management of corrosion due to issues such as water disposal (i.e. environmental-related challenges), required service outages, LNG supplementation, high cost, and a lack of predictive information to inform long-term asset planning. In addition, hydrostatic testing can be detrimental to resident manufacturing flaws that may be present in electrical resistance welded (ERW) seam welds by activating these flaws to become time-dependent flaws.

Because HSTP requires the line to be shut down, consideration of this alternative was limited to laterals with redundant looping or laterals with practical means of supporting downstream customers. Therefore, the HSTP alternative was considered in greater detail for five laterals that were most practical to implement and that were capable of being supplemented with LNG during the hydrostatic testing, or laterals that were able to be taken out of service without interruption to customers.

4.4.5 High Level Financial Screening of Remaining Feasible Alternatives

In addition to the technical criteria, FEI evaluated the alternatives based on high level cost estimates.

Initially, high level cost estimates were used to screen out technically feasible alternatives that were cost prohibitive and therefore considered to be not financially feasible[25]. Based on the high level cost estimates for the PLE alternative as shown below in Table 4-7, it is clear that the cost of the PLE alternative is either higher or comparable to other alternatives that were able to provide better integrity and asset management capabilities. FEI therefore did not pursue the PLE alternative further in the evaluation process.

Table 4-7: High Level Cost Comparison of PLE to Other Alternatives (2018$)

Lateral	ILI ($ millions)	PLR ($ millions)	PRS ($ millions)	PLE ($ millions)
BC Forest Products Lateral 168	6.7	3.3	3.7	4.2
Cariboo Pulp Lateral 168	5.1	3.8	3.4	6.1
Kamloops Lateral/Loop 168	11.2	12.4	N/A*	26.5
Salmon Arm 3 Lateral 168	5.1	2.8	N/A*	4.6

**PRS was not feasible for these laterals and as a result, no cost estimate was developed.*

High level cost estimates were completed for HSTP for the five laterals for which it was a technically feasible alternative, as shown below in Table 4-8. The hydrostatic tests would be repeated every five to ten years, and in this case, the HSTP costs assumed a test frequency of every seven years over a 66-year period. As shown below, the HSTP alternative was cost prohibitive when compared to other alternatives that were either equal or superior in their technical performance. The cost of LNG supplementation for the industrial customers is cost prohibitive even for the BC Forest Products and Elkview Laterals which are two shorter single feed, un-looped laterals. As a result, FEI did not pursue the HSTP alternative further in the evaluation process.

Table 4-8: High Level Cost Comparison of HSTP to Other Alternatives (2018$)

Lateral	ILI ($ millions)	PLR ($ millions)	PRS ($ millions)	HSTP ($ millions)
BC Forest Products Lateral 168	6.7	3.3	3.7	36.0
Elkview Lateral 168	5.5	4.5	3.5	27.3
Cranbrook Lateral 168	10.6	79.8	N/A*	20.0
Cranbrook Loop 219	9.1	79.8	N/A*	51.5
Cranbrook Kimberley Loop 219	4.8	15.7	N/A*	10.1

**PRS was not feasible for these laterals and as a result, no cost estimate was developed.*

The PLR alternative for some of the longer laterals was also considered to be cost prohibitive when compared to the other technically feasible alternatives and was therefore not considered to be financially feasible and was not considered further in the evaluation process for these longer laterals. The high level cost estimates are shown below in Table 4-9.

[25] For the alternatives that are not technically feasible, no cost estimate is provided.

Table 4-9: High Level Cost Comparisons of PLR to Other Alternatives for Longer Laterals (2018$)

Lateral	ILI ($ millions)	PRS ($ millions)	PLR ($ millions)
Mackenzie Lateral 168	27.6	N/A*	71.7
Mackenzie Loop 168	15.4	N/A*	35.6
Prince George 3 Lateral 219	8.2	1.2	20.9
Northwood Pulp Lateral 168	8.5	1.2	23.4
Northwood Pulp Loop 219	8.0	1.2	22.8
Prince George 1 Lateral 168	8.2	N/A*	18.4
Prince George 2 Lateral 219	8.6	3.5	27.1
Williams Lake Loop 1 168	3.8	1.7	13.2
Williams Lake Loop 2 168	5.4	1.7	9.8
Salmon Arm Loop 168	19.7	N/A*	105.4
Coldstream Loop 168	8.3	3.4	14.7
Kelowna 1 Loop 219	8.3	4.0	8.2
Celgar Lateral 168	6.7	3.5	22.6
Castlegar Nelson 168	36.0	5.3	109.6
Trail Lateral 168	12.3	3.6	20.7
Fording Lateral 219/168	64.0	N/A*	186.8
Cranbrook Lateral 168	10.6	N/A*	79.8
Cranbrook Loop 219	9.1	N/A*	79.8
Cranbrook Kimberley Loop 219	4.8	N/A*	15.7
Cranbrook Kimberley Loop 273	5.3	N/A*	27.6
Kimberley Lateral 168	13.2	N/A*	48.3
Skookumchuck Lateral 219	4.7	N/A*	84.3

**PRS was not technically feasible for these laterals and as a result, no cost estimate was developed.*

For the ILI, PLR and PRS alternatives that were both financially and technically feasible, AACE Class 3 estimates were developed to compare alternatives for each lateral.[26]

4.4.6 Summary of Technical and High Level Financial Screening

The Status Quo - Modified ECDA alternative were screened out on a technical basis because it did not achieve the Project objective to mitigate the potential for rupture due to corrosion. The Robotics alternative was also screened out on a technical basis because it is not proven technology nor commercialized. The PRS alternative was also screened out on a technical basis for the laterals where there are capacity limitations. Modified ECDA, Robotics and PRS

[26] FEI developed the cost estimates for alternatives to a Class 3 level to allow for a more accurate comparison of costs.

for some laterals were not considered to be technically feasible and therefore, were not considered further in the evaluation process.

Both the PLE and some of the HSTP alternatives were considered to be technically acceptable but were screened out on a financial basis because they were considered to be cost prohibitive when compared to the other technically superior alternatives. The PLR alternative for some of the longer laterals was also screened out on a financial basis because it was cost prohibitive when compared to the other technically feasible alternatives. PLE, HSTP, and PLR for some of the longer laterals were not considered to be financially feasible and therefore, were not considered further in the evaluation process.

The ILI, PLR and PRS were evaluated to be technically superior to the other alternatives with ILI providing the highest technical rating for each alternative[27]. These alternatives also presented the most cost effective solutions. AACE Class 3 estimates were developed to compare the remaining alternatives for each lateral.

4.5 *ANALYSIS OF THREE REMAINING FEASIBLE ALTERNATIVES*

FEI evaluated each of the remaining three feasible alternatives (PRS, ILI and PLR) for each lateral using the evaluation methodology described above. The following sections outline the findings of the alternative evaluation process.

4.5.1 Selection of PRS Where Viable

For the laterals for which PRS was viable, PRS was chosen as the preferred alternative in all cases except for one because of the ability of this alternative to meet the objectives of the Project at the lowest cost, with the added benefit of limited ground disturbance and community impacts. PRS was generally the lowest cost alternative. For Project Execution and Lifecycle Operation, PRS scored from 4.3 to 4.6, compared to 2.8 to 3.7 for ILI and PLR. As a result, PRS was selected as the preferred alternative for all of the laterals where PRS was viable except for one.

In the one case where PRS was viable but not selected as the preferred alternative, PLR was chosen as PLR had a higher overall score, was financially comparable to PRS, with better integrity and asset management capability benefits. FEI's internal subject matter experts also recommended PLR over PRS in this case, in alignment with the overall scoring.

4.5.2 ILI More Cost Effective for Longer Pipelines

Where PRS was not feasible, ILI and PLR were compared to determine the best solution. For most laterals, ILI and PLR both scored comparably under the technical criteria of preventing rupture and leaks; however, ILI has an advantage of providing better proactive asset management capability. The ILI and PLR alternatives also had comparable Project execution

[27] Detailed technical scores for ILI, PRS and PLR are provided in Appendix I.

and lifecycle operation technical criteria scores, with slight differences depending on the terrain and potential challenges from working on Indigenous community lands, archaeological sites, environmental concerns and crossings. In terms of financial evaluation, the difference in scores between ILI and PLR for each lateral depended mostly on the length of the lateral.

For the longer laterals, especially those longer than 4 kilometres, the PV of incremental revenue requirement and rate impacts were much higher for PLR when compared to ILI for the same lateral. ILI was therefore selected for all of the laterals that were longer due to having a lower rate impact along with providing better proactive asset management capability.

4.5.3 PLR for Shorter Pipelines

For the shorter laterals, especially those less than 4 kilometres in length, the PV of incremental revenue requirements and rate impacts were typically less for PLR when compared to ILI for the same lateral. The PLR alternative for the shorter laterals thus achieved the highest financial score. This financial score combined with a comparable technical score, resulted in the highest overall score for the PLR alternative as compared to the ILI alternative and was therefore selected as the preferred alternative.

4.5.4 Preferred Alternatives for Each Lateral

Based on the rationale described in the previous sections, the remaining alternatives, their respective present value of incremental revenue requirements (66 years) and the preferred alternatives for each lateral are shown below. For those laterals that were considered not feasible for PLR and/or PRS as discussed in Section 4.4.5 above, no present value of incremental revenue requirements are shown in the table below.

Table 4-10: Preferred Alternative for Each Lateral and Present Value of Incremental Revenue Requirement over 66-years of Analysis Period

Lateral	Length (kilometres)	ILI Present Value ($ millions)	PLR Present Value ($ millions)	PRS Present Value ($ millions)	Preferred Alternatives
Mackenzie Lateral 168	28.7	45.8	-	-	ILI
Mackenzie Loop 168	14.2	24.9	-	-	ILI
BC Forest Products Lateral 168	0.5	12.6	4.5	7.0	PLR
Prince George 3 Lateral 219	5.3	14.3	-	2.2	PRS
Northwood Pulp Lateral 168	6.0	15.4	-	2.2	PRS
Northwood Pulp Loop 219	5.8	14.1	-	2.2	PRS
Prince George #1 Ltl 168	4.7	14.2	-	-	ILI
Prince George Pulp Lateral 168	1.0	14.3	7.4	3.6	PRS
Husky Oil Lateral 168	1.1	16.4	5.5	3.6	PRS
Prince George #2 Lateral 219	8.7	15.8	-	6.3	PRS
Cariboo Pulp Lateral 168	1.3	10.5	5.3	6.5	PLR
Williams Lake Loop 168	5.9	15.7	-	6.0	PRS
Kamloops 1 Lateral & Loop 168	6.6	32.1	16.3	-	PLR
Salmon Arm Loop 168	44.9	33.6	-	-	ILI
Salmon Arm 3 Lateral	0.9	10.5	3.8	-	PLR
Coldstream Lat 219	1.8	13.2	8.5	5.9	PRS
Coldstream Loop 168	3.8	14.2	-	6.0	PRS
Kelowna 1 Loop 219	2.1	14.0	-	6.9	PRS
Celgar Lateral 168	5.8	11.7	-	5.9	PRS
Castlegar Nelson 168	37.4	54.2	-	9.0	PRS
Trail Lateral 168	4.2	19.0	-	5.9	PRS
Fording Lateral 219/168	79.7	102.3	-	-	ILI
Elkview Lateral 168	1.6	10.1	5.8	5.9	PRS
Cranbrook Lateral 168	34.0	22.3	-	-	ILI
Cranbrook Loop 219	34.0	20.5	-	-	ILI
Cranbrook Kimberley Loop 219	4.0	9.2	-	-	ILI
Cranbrook Kimberley Loop 273	9.4	10.7	-	-	ILI
Kimberly Lateral 168	20.6	23.3	-	-	ILI
Skookumchuck Lateral 219	35.9	13.8	-	-	ILI

The Elkview Lateral has comparable net present values for the PLR and PRS alternatives. However, due to higher capital costs and the larger construction impact associated with a PLR installation in an industrial environment as compared to the PRS, the PRS alternative was selected.

The detailed evaluation of the 29 Transmission Laterals can be found in Appendix I.

4.6 *CONCLUSION*

In summary, the preferred alternatives for each lateral will allow FEI to achieve its main objective of mitigating the potential for failure by rupture due to corrosion. In each case, FEI has analyzed and compared the feasible alternatives and recommended the most cost effective alternative taking into account relevant factors.

5. PROJECT DESCRIPTION

5.1 *INTRODUCTION*

In this section, FEI describes the preferred alternative for each of the 29 Transmission Laterals in more detail including information on components, schedule, resources requirements, risks and management. As discussed in Section 4, FEI evaluated and determined the preferred alternative for each of the 29 Transmission Laterals. The preferred alternative for each lateral is as follows:

Table 5-1: Preferred Alternatives for Each Lateral

Line/ Loop ID No.	Line/Loop Full Name	Line Length (kilometres)	Preferred Alternative
1	Mackenzie Lateral 168	28.6	In-line Inspection
2	Mackenzie Loop 168	14.2	In-line Inspection
3	BC Forest Products Lateral 168	0.5	Pipeline Replacement
4	Prince George 3 Lateral 219	5.3	Pressure Regulating Station
5	Northwood Pulp Lateral 168	6.0	Pressure Regulating Station
6	Northwood Pulp Loop 219	5.8	Pressure Regulating Station
7	Prince George 1 Lateral 168	4.7	In-line Inspection
8	Prince George Pulp Lateral 168	1.0	Pressure Regulating Station
9	Husky Oil Lateral 168	1.1	Pressure Regulating Station
10	Prince George 2 Lateral 219	8.6	Pressure Regulating Station
11	Cariboo Pulp Lateral 168	1.3	Pipeline Replacement
12.1	Williams Lake Loop 1 168	3.4	Pressure Regulating Station
12.2	Williams Lake Loop 2 168	2.5	Pressure Regulating Station
13.1	Kamloops 1 Lateral 168	3.6	Pipeline Replacement
13.2	Kamloops 1 Loop 168	3.1	Pipeline Replacement
14	Salmon Arm Loop 168	44.9	In-line Inspection
15	Salmon Arm 3 Lateral 168	0.8	Pipeline Replacement
16	Coldstream Lateral 219	1.8	Pressure Regulating Station
17	Coldstream Loop 168	3.8	Pressure Regulating Station
18	Kelowna 1 Loop 219	2.1	Pressure Regulating Station
19	Celgar Lateral 168	5.8	Pressure Regulating Station
20	Castlegar Nelson 168	37.4	Pressure Regulating Station
21	Trail Lateral 168	4.2	Pressure Regulating Station
22.1	Fording Lateral 219	34.5	In-line Inspection
22.2	Fording Lateral 168	45.1	In-line Inspection
23	Elkview Lateral 168	1.6	Pressure Regulating Station
24	Cranbrook Lateral 168	34.0	In-line Inspection

Line/ Loop ID No.	Line/Loop Full Name	Line Length (kilometres)	Preferred Alternative
25	Cranbrook Loop 219	34.0	In-line Inspection
26	Cranbrook Kimberley Loop 219	4.0	In-line Inspection
27	Cranbrook Kimberley Loop 273	9.4	In-line Inspection
28	Kimberley Lateral 168	20.6	In-line Inspection
29	Skookumchuck Lateral 219	35.9	In-line Inspection

The sections below describe the Project and include the:

- Basis of design and engineering, basis of the AACE Class 3 cost estimate, and the construction, installation and commissioning plans for the ILI, PRS, and PLR components;
- Project cost estimate, including risk assessment, contingency and reserve determination;
- Construction verification and commissioning along with a summary schedule;
- Project resourcing requirements;
- Identified Project impacts; and
- Required permits and approvals.

5.2 *BASIS OF DESIGN AND ENGINEERING*

5.2.1 In-Line Inspection (ILI)

For laterals where ILI was selected as the preferred alternative, the Project involves installation of pig barrels at each end of the pipeline to allow ILI tools to be launched and retrieved, and the removal of all obstructions in the pipeline that may prevent successful tool runs, including restrictive fittings and bends, and pipe size or wall thickness changes.

5.2.1.1 Standards and Specifications

The design, construction and operation of FEI natural gas pipelines and stations are conducted in accordance with BC OGC regulations and the CSA Standard Z662 “Oil and Gas Pipeline Systems”. The ILI portion of the Project, comprising both pipelines and stations, will be developed in accordance with all applicable statutory codes and standards including FEI’s internal standards.

Table 5-2 lists the applicable industry standards and specifications for the Project.

Table 5-2: Applicable Industry Standards and Specifications

Document	Description
CSA Z662-15	Oil and Gas Pipeline Systems
CSA Z245.1-18	Steel Pipe
CSA Z245.11-17	Steel Fittings
CSA Z245.12-17	Steel Flanges
CSA Z245.20-14	External Fusion Bond Epoxy Coating for Steel Pipe
CSA C22.3 No. 6	Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines
CAN/CSA-G40.21-13	Specification for Structural Quality Steels
OCC-1-2005	Recommended practice for Control of External Corrosion on Buried or Submerged Metallic Piping Systems

5.2.1.2 Control Valve Assemblies (CVA)

The installation of a CVA is a prerequisite to enable ILI modifications of an in-service line. The CVA is required to control the operating pressure as needed for live line welding requirements and also to control the maximum recommended pressure for the installation of the stopple plugging system in order to perform the modification work.

The CVA consists of a gas filter, and a pneumatically actuated valve assembly with two control valves (one functions as the main controller and the other as the monitor). In addition, two isolation valves and one bypass valve are required so that the CVA can be bypassed during normal operation when pressure control is not required or when the CVA is maintained so as not to interfere with the main pipeline flow. Telemetry is required to provide Gas Control with the ability to monitor the set pressure.

The CVA will be installed in a fenced site with one vehicle gate. The site footprint is typically 14 meters by 28 meters. For some laterals, the site may need to be larger to accommodate site specific requirements. A typical CVA is designed to utilize the existing ROW.

Refer to Confidential Appendix J-1 (Appendix H3 to the Stantec FEED) for a CVA schematic and typical CVA site layout.

5.2.1.3 Launcher and Receiver Assemblies (LA, RA)

The LA and RA were designed to provide launching and receiving capability for ILI tools.

Because the existing ROW width varies for each lateral, all above ground replacements were designed to occupy minimal ROW width. The overall size of each designed facility is governed by the standard size of its component fittings, as well as the following assumptions:

- Minimum pipe length between girth welds equal to two pipe diameters where no side connections are installed on the pipe; pipe pup length increased by one pipe diameter for each side connection installed;
- Buried depth 1,200 millimetres to top of pipe; and
- Above ground elevation 1,000 millimetres to pipe centerline.

In addition, pig launcher and receiver assemblies of all diameters were designed for an ILI tool length of up to 6 metres, resulting in an overall launcher barrel length of 8 metres, and receiver barrel length of 10 metres.

Design drawings for typical NPS 6 and NPS 8 LA and RA drawings are included in Confidential Appendix J-1 (Stantec FEED, Appendix H4).

Non-adjustable pipe supports are required for the LA and RA anchored to concrete foundations as per previous designs for FEI projects. The launcher and receivers include 12 supports each for the assembly and the buried bypass.

5.2.1.4 Main Line Valve Assemblies (MLVA)

Replacement of all non-ILI compatible main line valve assemblies is required to allow successful passage of the ILI tool through the pipeline. Table 5-3 lists the criteria and assessment for typical valves found in natural gas pipelines.

Table 5-3: Valve Replacement Criteria

Criteria	Notes	Assessment	Rationale
Type: Plug	Assumed to be reduced port	Replace *	Not considered ILI capable
Type: Ball or Gate	ILI capable only if full port	Replace *	Port size (ILI capability) generally unknown
Type: ALL (adjacent blowdown tees not barred)	Adjacent tees require replacement	Replace *	Blowdown tee replacement cost warrants replacement of entire valve assembly

** All new mainline lateral valve assemblies will be installed above ground.*

The above ground MLVAs are designed to maintain the present function of each lateral pipeline, such as isolation and blowdown capability. As the existing ROW width varies for each of the 29 Transmission Laterals, all above ground replacements were designed to occupy minimal ROW width. The overall size of each designed facility is governed by the standard size of its component fittings, as well as the following assumptions:

- Minimum pipe length between girth welds equal to two pipe diameters where no side connections are installed on the pipe; pipe pup length increased by one pipe diameter for each side connection installed;

- Buried depth 1200 millimetres to top of pipe; and
- Above ground elevation 1000 millimetres to pipe centreline.

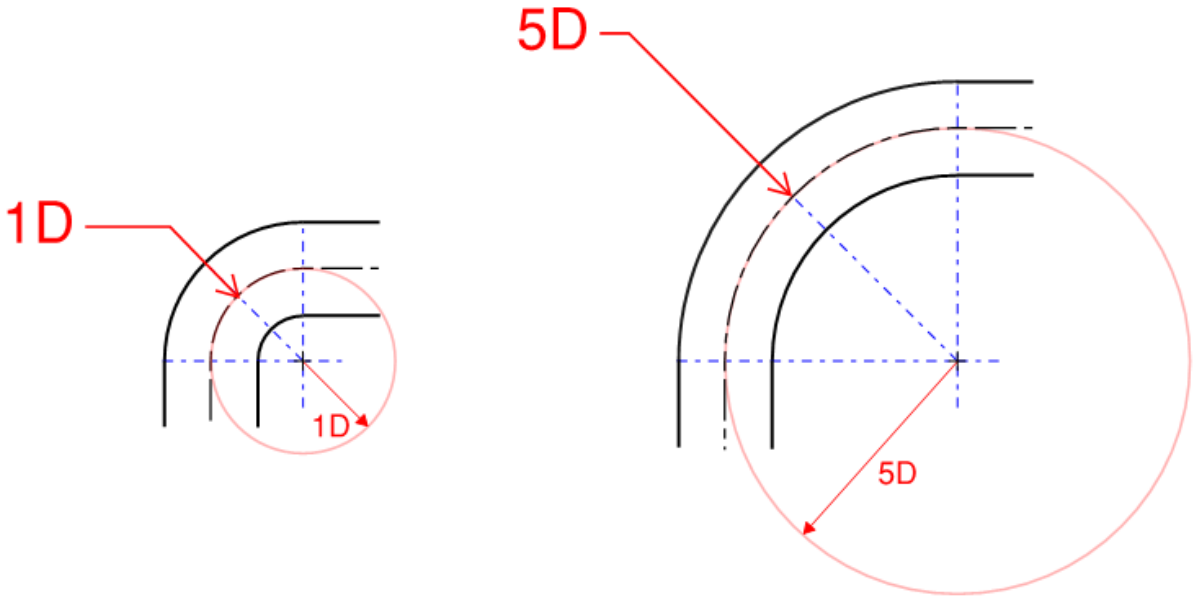
Design drawings for typical NPS 6 and NPS 8 MLVAs are included in Confidential Appendix J-1 (Stantec FEED, Appendix H5).

Adjustable pipe supports are required for the MLVAs anchored to concrete foundations as per previous designs on FEI projects. The valve replacements include two supports each under the blowdowns.

5.2.1.5 Restrictive Bends and Fittings

Replacement of restrictive bends (bends) and elbow fittings are required to allow successful passage of the ILI tool through the pipeline with minimal speed excursions. They will be replaced with an induction bend of equivalent inflection having a radius of curvature five times the pipe diameter (5 D). Below in Figure 5-1, a visual comparison of a typical 1 D 90 degree bend to a 5 D 90 degree bend is shown.

Figure 5-1: Comparing 1D bends (restrictive fittings) to 5D bends (induction bends)



A Typical Elbow Replacement Plan View is included in Confidential Appendix J-1 (Stantec FEED, Appendix H6). The replacement criteria and assessment for bends and elbows can be found in Table 5-4.

Table 5-4: Elbow Replacement Criteria

Criteria	Notes	Assessment	Rationale
Elbow or Bend, Radius of Curvature < 1.5 D	Based on outside diameter	Replace	ILI tools incapable of passing through bend radius less than 1.5 D without speed excursion
Elbow Fitting	All elbow fittings assumed to be Long Radius and standard wall thickness	Replace	Radius typically < 1.5 D for D < NPS 16; heavier wall also expected
Bend, General	Bend type and radius typically unknown	Do Not Replace	Field and induction bends expected to have radii > 1.5 D
Bend, Listed Angle (degrees within +/- 3 degrees of 30, 45, 60, or 90)	Source of angle listed in GIS unknown (where listed) *	Replace	Angle listed may represent long radius elbow with nearby pipe roping/bending
Bend, Measured Angle (degrees within +/- 3 degrees of 30, 45, 60, or 90)	Angle measured using GIS Trail function *	Replace	Angle measured may represent long radius elbow with nearby pipe roping/bending

** Where an angle of inflection is listed, the value of the angle as determined by measurement using the GIS Trail function may deviate from the listed value by +/- 5 degrees or more.*

It is difficult to predict with a high degree of confidence the number and location of bends which will require replacement because they are buried and the as-built data is limited due to the vintage of the laterals. In order to obtain an estimate of the number of replacements, FEI first identified potential restrictive bends and fittings by selecting bends that had a bend angle larger than 20 degrees based on GIS data and historical records. FEI then conducted preliminary field surveys of a representative sample of locations along some of the laterals, including the Fording Lateral, Cranbrook Lateral, Salmon Arm Loop, and Mackenzie Lateral, to validate the number of bends. The results from the preliminary field surveys were used to estimate the likely number of bends and was provided by FEI to Stantec to develop the cost estimate for laterals where ILI was the preferred alternative.

Buried branch connections will be replaced with a barred tee assembly of equivalent branch and run diameter. This is necessary to prevent the ILI tool from travelling down the wrong branch or potentially becoming lodged in the tee. Each tee assembly will be comprised of a standard unbarred tee and a branch pipe pup fitted with scraper bars extending into the tee branch to function as a barred tee. A typical horizontal tee replacement plan view is included in Confidential Appendix J-1 (Stantec FEED, Appendix H6). The replacement criteria and assessment for branch connections is shown below in Table 5-5.

Table 5-5: Branch Connection Replacement Criteria

Criteria	Notes	Assessment	Rationale
Maximum Branch / Run Diameter Ratio > 0.3 (scraper bars not confirmed)	Based on internal pipe diameter, assuming standard wall thickness	Replace	NACE SP0102-2010, 4.4.2.1.1
Unidentified Branch Connection	Visible in GIS, but not returned in search results (i.e. no associated fitting, potentially a pipe-to-pipe connection)	Subject to Branch / Run Diameter Ratio	Scraper bars not likely installed
Branch Diameter Unknown	Existing fitting branch diameter is unknown, or branch components of unidentified branch connection are of unknown diameter	Replace	Assessed as replacement until branch diameter can be determined
Stopper or Thread-O-Ring (TOR)	Install coupon (stoppers) or engineered threaded plug (TOR)	Do Not Replace	Branch diameter may exceed maximum ratio, but complete replacement not required
Tap	Tap diameter typically unknown	Do Not Replace	Generally branch diameter NPS 1 or smaller; should not require replacement
Terminating Branch Connections (“Stubs”)	Branch connections comprised of short branch pipe segment terminating with weld cap	Replace	May supply smaller branch connections visible only in the IP or DP systems

5.2.1.6 Wall Thickness Transitions

FEI analyzed wall thickness transition and concluded that a 1.6 millimetres difference in wall thickness is the upper limit for acceptance. Based on the threshold of a 1.6 millimetres wall thickness transition, the following modifications are required.

1. New Pipe Replacement: some pipe segments are required to be replaced to reduce the wall thickness transition within 1.6 millimetres;
2. Bend Replacement: some bends are required to be replaced to reduce the wall thickness transition within 1.6 millimetres, regardless the radius. Note that in the cost estimate, short pipe segment replacements of less than 100 metres will be considered as equivalent to a bend replacement and were estimated as such;
3. Crossing replacement: some road crossings, especially highway crossings, are heavy wall pipe and may have a wall thickness transition of more than 1.6 millimetres. For the budgetary approval purpose, they are included in the cost estimate as replacement by

HD bore. Further investigation and calculation will be completed during the detailed engineering stage; and

4. MLVA replacement: some valve stations or station piping are required to be replaced to reduce the wall thickness transition within 1.6 millimetres.

5.2.1.7 Stopple Upgrades

Some existing stopples have not retained the stopple coupons. The coupon is the section of pipe that is removed, to establish tapping service. It is highly desirable to retain the coupon to minimize pigging hazards. Coupon retention is mostly done by u-wires. These wires run through the pilot bit and are cut and bent, so that they can fold back against the bit into a relief area milled into the bit. The coupon is then folded out when the pilot bit cuts through the pipe. Multiple u-wires are used to act as insurance against losing the coupon. Stopples that have lost their coupons create pigging hazards as the opening of tapped holes can potentially catch or damage pigging tools.

The remediation option proposed is to install a custom plug with extension and guide bars. This installation requires no field welding. The stopple location is required to be exposed. A hot tap sub-contractor will install the plugging head, install custom plugs and adjust the orientation.

The stopple upgrade work included in the cost estimate is based on the second option of using a custom plug with extension and guided bars.

5.2.1.8 New Pipe Segments

There are three (3) types of new pipe segments required for ILI upgrade:

- Category I - Pipe replacement: This is similar to a bend replacement, but straight pipe is replaced for diameter change, wall thickness transition (as previously discussed) or welding conditions. No additional right-of-way (ROW) is required.
- Category II – Pipe looping: This is mainly for bored crossings where new crossing pipe will loop the existing pipe. Additional ROW of 8 metres is required.
- Category III – Pipeline extension: One example of pipeline extension is Mackenzie Lateral 168 where an extension of the lateral across the Mischinsinlika Creek will enable one continuous ILI run. 18 metres of additional ROW is required for the extending segment.

5.2.1.9 Land Requirements

New ROW and Temporary Work Space (TWS) land requirements have been generated from the design of typical land layout drawings. Table 5-6 provides a summary of the land requirements for each installation type.

Table 5-6: ILI Site Dimensions

Item	Site Dimensions (metre x metre)	ROW Addition (metre x metre)	TWS Dimensions (metre x metre)
Mainline Valve Assemblies	14 X 6	0	50 X 10
Control Valve Assembly	12 X 14	12 X 6	36 X 6+48 X 10
Launcher and Receiver Assemblies	28 X 18	28 X 10	36 X 8+64 X 15
Bend Replacements	0	0	36 X 10

The above dimensions represent the land area required for each proposed facility as a new installation. The configuration of each facility will likely be modified during detailed design based on site-specific conditions.

5.2.1.10 Construction Verification and Commissioning

Upon completion of the addition of the launcher and receiver assemblies as well as the removal of all the known obstructions in the pipeline, verification runs will be conducted to confirm that there are no remaining obstructions that can cause an unsuccessful ILI run. This will include gauging plate runs to locate any remaining significant protrusions or bends in the pipeline followed by a calliper tool run to provide wall thickness transitions and geometry anomalies.

5.2.1.11 Laterals with ILI as Preferred Option

ILI was the preferred alternative for the 11 laterals listed below:

- Mackenzie Lateral 168
- Mackenzie Loop 168
- Prince George 1 Lateral 168
- Salmon Arm Loop 168
- Fording Lateral 219/168
- Cranbrook Lateral 168
- Cranbrook Loop 219
- Cranbrook Kimberley Loop 219
- Cranbrook Kimberley Loop 273
- Kimberley Lateral 168
- Skookumchuck Lateral 219

See Appendix K for a detailed description of the upgrades required for each lateral system.

5.2.2 Pressure Regulating Station (PRS)

The PRS alternative involves the installation of a facility to regulate the Maximum Operating Pressure (MOP) of the pipeline below 30% SMYS such that it mitigates the potential for rupture. The scope of work includes the installation of the facility placed in close proximity to the transmission tie-in location, including redundant pressure regulating assemblies. The facility would be located on fee simple land adjacent to the ROW.

5.2.2.1 Standards and Specifications

The design, construction and operation of FEI natural gas pipelines and stations are conducted in accordance with BC OGC regulations and the Canadian Standards Association (CSA) Standard Z662 "Oil and Gas Pipeline Systems". The PRS will be developed in accordance with all applicable statutory codes and standards including FEI's internal standards.

Table 5-7 lists the applicable industry standards and specifications for the Project.

Table 5-7: Applicable Industry Standards and Specifications

Document	Description
CSA Z662-15	Oil and Gas Pipeline Systems
CSA Z245.1-18	Steel Pipe
CSA Z245.11-17	Steel Fittings
CSA Z245.12-17	Steel Flanges
CSA Z245.20-14	External Fusion Bond Epoxy Coating for Steel Pipe
CSA C22.3 No. 6	Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines
CAN/CSA-G40.21-13	Specification for Structural Quality Steels
OCC-1-2005	Recommended practice for Control of External Corrosion on Buried or Submerged Metallic Piping Systems

5.2.2.2 Pressure Regulating Assemblies

A typical PRS is a pressure regulating assembly, consisting of gas filter, main and monitor control valves (actuated pneumatically by gas control and connected to pressure transmitter), pressure controller, backup power generator, pressure indicators, isolation valves, vent valves, and bleed valves. The PRS assembly will be in a building enclosure. The electrical modules will be installed in a separate telemetry building, which will be offset by 2 metres from the fence and offset by approximately 4.6 metres minimum to 6 metres maximum from any potential leak points in the mechanical components of the PRS assembly.

Design drawings and piping and instrumentation drawings of a typical PRS are available in Appendix K.

5.2.2.3 Civil and Foundations

Civil and foundation work includes site access development, grading, fencing, piling, installing concrete supports, pipe support and structural support, excavating, line staking and soil compacting appropriate for the land use.

5.2.2.4 Buildings

A typical PRS installation consists of two (2) buildings: the PRS building and the telemetry building.

Pressure regulating assemblies will be installed inside the PRS building, which will be a heated or unheated, self-framing type. The estimated footprint of the PRS building is 7 metres by 6 metres.

The telemetry equipment will be installed inside the telemetry building, which will be a heated, self-framing type. The building will include one (1) single-person door. The estimated footprint of the telemetry building is 2 metres by 2 metres and will be offset by a minimum of 2 metres from the fence and approximately 5 metres from the PRS assembly.

5.2.2.5 Land Requirements

The estimated footprint of the required land for the PRS is 20 metres x 15 metres. The PRS will be located in close proximity from the mainline tap to limit the length of non-ILI compatible pipeline operating above 30 percent SMYS. The PRS will be located on freehold land to maintain control of the site and access for regular maintenance.

5.2.2.6 Electrical, Instrumentation and Control

The PRS will include electrical power, instrumentation and control to allow remote monitoring of the facility.

5.2.2.7 Construction Verification and Commissioning

At the conclusion of construction, the PRS will undergo a comprehensive commissioning plan to check, inspect, test and validate the successful implementation of all control and safety modules, subsystems, and systems.

5.2.2.8 Laterals with PRS as Preferred Option

PRS is the preferred alternative for the 14 laterals listed below:

- Prince George 3 Lateral 219
- Northwood Pulp Lateral 168
- Northwood Pulp Loop 168

- Prince George Pulp Lateral 168
- Husky Oil Lateral 168
- Prince George 2 Lateral 168
- Williams Lake Loop 168
- Coldstream Lateral 219
- Coldstream Loop 168
- Kelowna 1 Loop 219
- Celgar Lateral 168
- Castlegar Nelson 168
- Trail Lateral 168
- Elkview Lateral 168

See Appendix K for a detailed description of the upgrades required for each lateral system.

5.2.3 Pipeline Replacement (PLR)

PLR involves the installation of a new pipeline in parallel to the existing pipeline. The new pipeline would be designed to operate below 30 percent SMYS such that it mitigates the potential for rupture. The scope of work would include the installation of the new pipeline within the existing ROW, required valve assembly and tie-ins to the mainline pipeline, and the abandonment in place of the existing pipeline once the new line is operational.

5.2.3.1 Standards and Specifications

The design, construction and operation of FEI natural gas pipelines and stations are conducted in accordance with BC OGC regulations and the CSA Standard Z662 “Oil and Gas Pipeline Systems”. The PLR component of the Project will be developed in accordance with all applicable statutory codes and standards including FEI’s internal standards.

Table 5-8 lists the applicable industry standards and specifications for the Project.

Table 5-8: Applicable Industry Standards and Specifications

Document	Description
CSA Z662-15	Oil and Gas Pipeline Systems
CSA Z245.1-18	Steel Pipe
CSA Z245.11-17	Steel Fittings
CSA Z245.12-17	Steel Flanges
CSA Z245.20-14	External Fusion Bond Epoxy Coating for Steel Pipe

Document	Description
CSA C22.3 No. 6	Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines
CAN/CSA-G40.21-13	Specification for Structural Quality Steels
API RP 1102-2007	Steel Pipelines Crossing Railroads and Highways, 7th Edition
TC E-10	Government of Canada, Transport Canada: Standards Respecting Pipeline Crossings Under Railways
CPR 2.39	Pipeline and Cable Installations Within Railway Right of Ways
OCC-1-2005	Recommended practice for Control of External Corrosion on Buried or Submerged Metallic Piping Systems

5.2.3.2 Route Selection

The route selection process adopted for the laterals where PLR was selected and the preferred alternative is based on a typical approach to routing a pipeline between fixed start and end points and any intermediate off take points, utilizing the existing pipeline's ROW where feasible. The final route selected must be:

- Safe (to construct and to operate);
- Environmentally acceptable - the route should minimize negative impact on the environment;
- Practical – the pipeline route should permit as much of the pipeline as possible to be constructed using modern standard pipeline construction techniques, minimizing the use of non-standard or higher risk techniques; and
- Economic – the route should both minimize Project costs and minimize local economic impact on communities that the pipeline passes through, and have the smallest footprint feasible (ideally the shortest distance between pipeline start and end points).

5.2.3.3 Pipe Specification

The pipe specification process for the proposed pipeline follows accepted industry practices, and meets all relevant code requirements, specifically those in CSA Z662-15 Oil and Gas Pipeline Systems. The wall thickness selection criteria for the PLR portions of the Project are based on several factors outlined in CSA Z662-15. The wall thickness selection is based on the following:

- CSA Z662-15 Section 12 hoop stress requirements. Section 12 requires that the hoop stress of the pipeline is less than 30 percent of the SMYS;
- Consideration of any proposed crossings (road or rail, cased or uncased) and minimum wall thickness requirements for the specific crossing type; and

- Consideration of pipe thinning during the induction bending process.

Consideration is given to selecting a consistent wall thickness in order to better accommodate pipeline ILI operations, ease constructability (through minimization of transition pieces and welds), and to maximize cost saving opportunities during the pipe production.

The design parameters for the new pipelines are presented in Table 5-9 below.

Table 5-9: New Pipeline Design Parameters

Parameter	Value
Fluid	Gas (non-sour service)
Design Pressure (Certified Operating Pressure)	6619 kilopascal (kPa)
Operating Hoop Stress level	< 30% SMYS
Maximum Operating Temperature	54 °C
Minimum Operating Temperature	-5 °C
Pipeline Buried Depth (min)	1.2 metres to top of pipe
Class Location	Class 3
Application	Above Ground and Below Ground
Location Factor	0.625 for all Classes
Design Factor	0.8
Joint Factor	1.0
Temperature Factor	1.0
Specified Minimum Yield Strength of Steel	359 megapascal (MPa)
Minimum Line Pipe Wall Thicknesses*	7.1 millimetres (NPS 6) 8.2 millimetres (NPS 8) 9.3 millimetres (NPS 10)
Minimum Heavy Pipe Wall Thicknesses*	7.1 millimetres (NPS 6) 8.2 millimetres (NPS 8) 9.3 millimetres (NPS 10)
Pipe External Coating	Fusion Bonded Epoxy (FBE)

** Note: These wall thicknesses will be refined based on site specific design parameters during detailed design stage.*

5.2.3.4 Isolating Valves

Isolating valves will be installed for the purpose of isolating the pipeline for maintenance and for response to operating emergencies. Valve location and spacing will follow Table 4.7 of the CSA Z662-15 standard.

5.2.3.5 Corrosion Protection

5.2.3.5.1 COATING PROTECTION

External coatings provide the first level of defence against external corrosion of buried steel piping, and are required by the CSA Z662 standard. Coating protection involves the application of a layer of factory applied corrosion resistant material to the outside of the pipe after manufacture and prior to delivery for construction. There are different coating materials available depending on the specific requirements. Fusion Bonded Epoxy (FBE) has been selected as the most appropriate coating for the PLR pipelines. FBE material is a high quality durable, industry accepted coating.

5.2.3.5.2 CATHODIC PROTECTION

Cathodic protection is generally regarded as a secondary defense against external corrosion, used in conjunction with coatings. It is also a requirement of the CSA Z662 standard. Corrosion control of the PLR pipelines will be achieved via the protective external coating described previously and an impressed current cathodic protection system. Cathodic protection is supplied via an impressed current cathodic protection system, comprised of rectifiers and/or deep anode beds.

5.2.3.6 In-Line Inspection Capability

The design of the proposed pipeline will have the capability of completing ILI including appropriate selection of bends, tees, valves and wall thickness transitions, but will require the future addition of Launcher and Receiver Assemblies to permit successful ILI.

5.2.3.7 Land Requirements

New ROW and TWS land requirements have been generated using the typical ROW cross section, summarized in Table 5-10.

Table 5-10: PLR Land Requirements

Item	Site Dimensions (metre x metre)	Additional ROW (metre x metre)	Additional TWS (metre x metre)
Conventional Crossing	0	10 x 8	10 X 5
Bored Crossing	0	10 x 8	10 X 10

Installation of the pipelines will require an additional 8 metre wide ROW adjacent to the existing 10 metre wide ROW to form a total width of 18 metres. In addition, a 5 metre wide temporary work space will be required for the typical pipeline installation and an additional 10 metre wide temporary work space will be required for bored crossings.

5.2.3.8 Construction Verification and Commissioning

At the conclusion of construction, the PLR will undergo a comprehensive pre-commissioning and commissioning plan to check, inspect, test and validate the successful implementation of all control and safety modules, subsystems, and systems. It is important in pre-commissioning to ensure that the pipeline as well all the facilities have been completed according to the Project Specifications and that commissioning and operation will take place safely and effectively. In addition, during the pre-commissioning FEI will verify that all the relevant data with the commissioning of the pipeline has been collected and that the commissioning procedure is presented and discussed with all operations personnel involved. FEI will also verify that all the necessary drawings and technical information have been received and that the operating plan has been created.

5.2.3.9 Abandonment Process

The existing lateral pipeline will be abandoned in place once the new pipeline is in service. It is not possible to abandon or remove the existing pipeline prior to installation and commissioning of the new pipeline in its entirety, as supply must be maintained to all customers

In accordance with CSA Z662-15 and the Company's internal standards, the pipeline will be abandoned in the following stages:

- Emptied of service fluids;
- Purged and appropriately cleaned;
- Physically separated from any in-service piping;
- Cut and capped below grade; and
- No longer cathodically protected or maintained according to normal maintenance schedules.

The pipeline will be sectioned into shorter segments, and all open ends plugged or sealed with watertight closures in order to minimize potential gas or water migration. All recorded data pertaining to the abandoned pipeline, including location and depth of cover, will be maintained on file.

5.2.3.10 Laterals with PLR as Preferred Option

Pipeline replacement is the preferred alternative for the four laterals listed below:

- BC Forest Products Lateral 168;
- Kamloops 1 Lateral and Loop 168;
- Salmon Arm 3 Lateral; and
- Cariboo Pulp Lateral 168.

See Appendix K for a detailed description of the replacement of each lateral.

5.3 *PROJECT COST ESTIMATE*

FEI in conjunction with Stantec developed the Project cost estimate using AACE International Recommended Practices Nos. 18R-97 and 97R-18 as guides. The AACE Class 3 cost estimate is based on quantities developed from designs and material take-offs (MTOs) completed by Stantec. Stantec then used these quantities as the basis to develop the direct and indirect costs.

Stantec estimate include:

- Pipeline and stations direct construction costs including land acquisition;
- Pipeline and stations indirect construction costs;
- Construction sub-contracts; and
- Engineering services.

FEI completed the portion of the Project cost estimate related to owner's costs (Owner's Costs), which includes the following:

- Project management and engineering;
- Permits and approvals;
- Consultation;
- Environmental and archaeological monitoring; and
- Inspection and operations coordination.

Contingency and management reserve are explained in Section 5.3.2 and 5.3.4.

5.3.1 Basis of Estimate

The Basis of Estimates are attached in Confidential Appendices J-2, J-3 and J-4 for ILI, PRS and PLR alternatives respectively. These documents detail:

- Estimate background:
  - Purpose and objective of the estimate;
- Basis of estimate
  - Scope of the estimate;
  - Assumptions; and

- Quantity derivation and cost basis:
  - Material and equipment cost basis;
  - Labour rates;
  - Contractors indirects;
  - Estimate allowances;
  - Other costs and indirects;
  - Engineering services; and
  - Freight.

The ILI, PRS and PLR cost estimates are outlined in Confidential Appendix J-1 (Stantec FEED Appendices B2, B3 and B4). These documents present the following details with respect to estimate scope, procurement, construction and engineering assumptions:

- Work breakdown structure;
- Direct and indirect costs;
- Estimate pricing;
- Construction costs:
  - Labour costs;
  - Direct labour;
  - Employer contributions;
  - Productivity;
  - Equipment; and
  - Other construction costs.
- Unit Price Items, engineering and materials costs;
- Construction:
  - Detailed construction assumptions;
  - Watercourse crossings;
  - Mobilization and demobilization (equipment);
  - Maintenance and services;
  - Key sub-contracts; and
  - Construction and productivity assumptions; and
- Design assumptions, and exceptions:

- Roads;
- Utilities and foreign pipelines;
- Watercourse;
- Trenchless crossings;
- Induction bends;
- Launcher and receiver barrels; and
- Valves.

5.3.2 Project Cost Estimate Details

The Project capital cost estimate is forecasted to be $323.296 million in 2018 dollars or $362.904 million in as-spent dollars (including AFUDC of $15.436 million)[28]. It includes contingency of 17 percent as well as a management reserve of 11 percent that FEI plans to hold based on the current understanding of the Project's risk profile and to account for possible scope changes or unknown future events which cannot be anticipated and which were not quantified in the risk register. The capital cost estimate with the management reserve approximates a P70 confidence level and will form the Project capital budget[29]. Table 5-11 presents a summary of the Project capital budget.

[28] Of the total $362.904 million including contingency and management reserve, $347.157 million of capital and $15.422 million of AFUDC is charged to Gas Plant in Service; $0.311 million abandonment/demolition costs plus $0.014 million of AFUDC is charged to Net Salvage Deferral Account. The total AFUDC charged to Gas Plant in Service and to Net Salvage Deferral Account is $15.436 million.

[29] The contingency of 17 percent of the total base capital plus the management reserve of 11 percent of the total base capital equals to the 28 percent to achieve the P70 confidence level as discussed in Section 5.3.4.3.

Table 5-11: Summary Project Capital Budget ($ millions)[30]

	2018 $	As-Spent $
Construction		
Materal & Unit Price Items	49.140	52.853
Construction - Direct and Indirect	136.768	146.999
Removal/Abandonment	0.226	0.243
Property and Right of Way	13.975	14.995
Contingency - Construction	34.019	36.565
Subtotal - Construction	234.129	251.655
Engineering and Development	14.845	15.715
FEI Project Management	38.368	41.403
Contingency	8.465	9.129
Management Reserve	27.489	29.567
Subtotal (incl. Construction)	323.296	347.468
AFUDC	-	15.436
TOTAL Project Capital Budget	***323.296***	***362.904***

5.3.2.1 Escalation

All cost estimates, including material supply and construction contracts, were developed based on 2018 market prices. An inflation escalation rate of 2.0 percent per annum is used based on the current forecast of BC CPI (July 2018) for both the as-spent capital cost estimates and the 60-year financial analysis.

5.3.2.2 GST and PST

The cost estimate excludes GST but includes 7 percent PST on materials. FEI, as a GST registrant, is entitled to recover the GST it pays on its taxable purchases. As such, the tax does not represent a net cost to FEI.

5.3.3 Cost Estimate Validation

Cost estimate quality assurance and validation were completed as follows:

- Internal Stantec reviews that included peer reviews, document quality checks, and independent review;
- Validation reviews involving both Stantec and FEI team members throughout the estimate development process to confirm that the estimate assumptions were valid;
- External independent review to verify that the estimate criteria and requirements were met and a documented, reasonable estimate was developed; and

[30] Excludes Project deferral costs discussed in Section 6.3.3. Including the Project deferral cost, the total Project Cost is estimated to $363.895 million in as-spent dollars.

- Independent internal and external reviews of the unit rates for the bend replacement.

5.3.4 Risk Analysis and Contingency Determination

FEI engaged Stantec to conduct a risk analysis to identify the technical and non-technical risks associated with the Project (Risk Report). The Risk Report is included as Confidential Appendix L-1. FEI augmented Stantec's risk analysis with input from two independent experts: one from Bramcon Project Consultants Ltd (Bramcon), an engineering and project management company, and the other from Validation Estimating LLC, USA (Validation Estimating), a company that provides services in estimate validation, risk analysis and contingency estimation. Bramcon conducted a simulation to assist in establishing the most likely number of restrictive bends that could be found for the ILI component so as to inform the most likely estimated contingency[31]. Bramcon's report, "Report 1801-1 Analysis of Fittings for Inline Inspection" (Bramcon Report), is provided as Confidential Appendix L-2. The second independent expert analysis was conducted by Validation Estimating and was done to provide a check of the adequacy of the Stantec contingency estimates for the Project risks over a multiyear execution timeframe. This analysis uses a parametric model and is described in the report titled "Risk Analysis and Contingency Benchmarking Analysis" provided as Confidential Appendix L-3.

Ultimately, the risk analysis, as supplemented by the reports from Bramcon and Validation Estimating, were used to establish a contingency percentage at the P50 confidence level. FEI also set a management reserve[32] of 11 percent based on the current understanding of the Project's risk profile and to account for possible scope changes or unknown future events which cannot be anticipated and which were not quantified in the risk register. The Project budget with the management reserve approximates a P70 confidence level.

5.3.4.1 Risk Identification Planning

The risk identification and qualitative analysis was completed using the AACE International Recommended Practice 62R-11: *Risk Assessment: Identification and Qualitative Analysis* (Revision May 11, 2012) (AACE 62R-11) as a guide. First, the risks were identified through a collaborative undertaking between Stantec and FEI through a risk workshop facilitated by Stantec in April 2018. The team next developed:

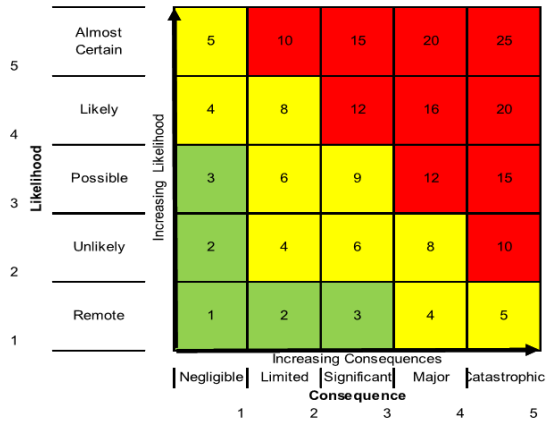
- the risk response actions; and
- the risk likelihood and consequence scales.

[31] Contingency is defined in AACE International Recommended Practices 10S-90: *Cost Engineering Terminology* as: "An amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, and/or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. Typically estimated using statistical analysis or judgment based on past asset or project experience." Contingency by AACE definition is expected to be spent.

[32] Management Reserve is defined in AACE International Recommended Practices 10S-90: *Cost Engineering Terminology* as: "An amount added to an estimate to allow for discretionary management purposes outside of the defined scope of the project, as otherwise estimated. May include amounts that are within the defined scope, but for which management does not want to fund as contingency or that cannot be effectively managed using contingency."

The risk likelihood and consequence scales used for the Project are based on the 5 by 5 risk assessment matrix recommended in AACE 62R-11 which is illustrated in Figure 5-2.

Figure 5-2: Risk Assessment Matrix



5.3.4.2 Risk Register, Qualitative Assessment and Action Plan

The risk identification process identified a number of risks which were tabulated in the risk register included in Appendix A to Stantec's Risk Report (Confidential Appendix L-1). The risk response actions to deal with the identified risks were also recorded in the risk register. Once the risks were identified, a qualitative analysis was completed to prioritize or rank the risks so that the Project team could focus on risk response actions and recommendations. Through this qualitative process, a likelihood and consequence rating was assigned to each identified risk using the risk assessment matrix noted above.

5.3.4.3 Quantitative Risk Analysis and Contingency

Following the completion of the risk register a quantitative analysis using Monte Carlo Simulation was completed by Stantec to determine a distribution of possible cost outcomes associated with the existing scope of the Project at different levels of confidence. The Stantec analysis derived a risk adjusted P50 cost of $279 million representing a contingency of approximately 14.4%. Please refer to Confidential Appendix N-1 for further details on Stantec's methodology and results.

The Stantec cost estimate for the ILI component of the Project was developed assuming approximately 178 restrictive bends. The number of restrictive bends was determined by selecting a representative sample for some laterals and conducting above ground surveys (using line locating tools) and some sub-surface surveys. The surveys identified locations that were either an obstruction or not. Due to the limited capability of the investigations to quantify the most likely quantity of restrictive bends, FEI engaged Bramcon, an engineering and project management company, to undertake a simulation to assist in establishing the most likely number of bends.

The Bramcon analysis, as presented in Confidential Appendix L-2, recommends that the base estimate should be based on 200 restrictive bends. It is important to note that this analysis relates only to the number of restrictive bends and was done to assist in establishing a suitable contingency percentage. That is, considering the vintage of the 29 Transmission Laterals, the 200 restrictive bends is an indication of cost that is expected to be spent[33]. Essentially, any restrictive bend that is found becomes part of the Project's scope and must be replaced by the Project team. Using Bramcon's analysis to augment the results of Stantec's risk analysis, FEI determined a Project contingency of approximately 18 percent to achieve a P50 level of confidence.

FEI then engaged John Hollmann, principal/owner of Validation Estimating, to conduct a benchmarking analysis to provide a check of the adequacy of the Stantec contingency estimates for the Project risks over a multiyear execution timeframe. To conduct its check analysis, Validation Estimating relied on Stantec's cost, schedule and risk inputs and used a "hybrid" method to effectively cover both Project system risks and Project-specific risks (events and conditions).[34] The methodology is discussed in detail in Confidential Appendix L-3[35].

The results of the analysis conducted by Validation Estimating showed a wider range of cost outcomes over a similar confidence level when compared to those estimated by Stantec's analysis. The output of the Monte Carlo Simulation, assuming 0.75 correlation,[36] is as follows:

[33] Contingency by AACE definition is "expected to be spent." The expected value is not the P50 but rather it is the mean of the cost distribution curve. That is, the approximately 14% at the P50 estimated by Stantec is expected to be higher and the additional cost to the mean is expected to be spent, which is in accordance with AACE definition of contingency.

[34] A detailed explanation of the methodology is described "Project Risk Quantification" by John Hollmann, Probabilistic Publishing, Sugarland, TX (www.decisions-books.com), 2016. The efficacy of this model for many project types is described in Chapter 15.

[35] Pages 2-4.

[36] The hybrid method employed by Validation Consulting includes a major assumption about the correlation (i.e., 0.75) between the work on each of the 29 Transmission Laterals, which Mr. Hollmann refers to as individual projects. As stated in the report, "A positive correlation coefficient means that the 29 projects are not independent. A value of 1.00 means they are really just one project. A value of 0.00 means they are entirely independent. A value of 0.75 was selected as the base considering that these are executed by the same company, team and contractors using a common process and practices in an integrated program in the same region, etc. (e.g., if performance is poor in one, it will likely be poor in the others)."

Figure 5-3: Monte Carlo Simulation Using Line Project Correlation of 0.75

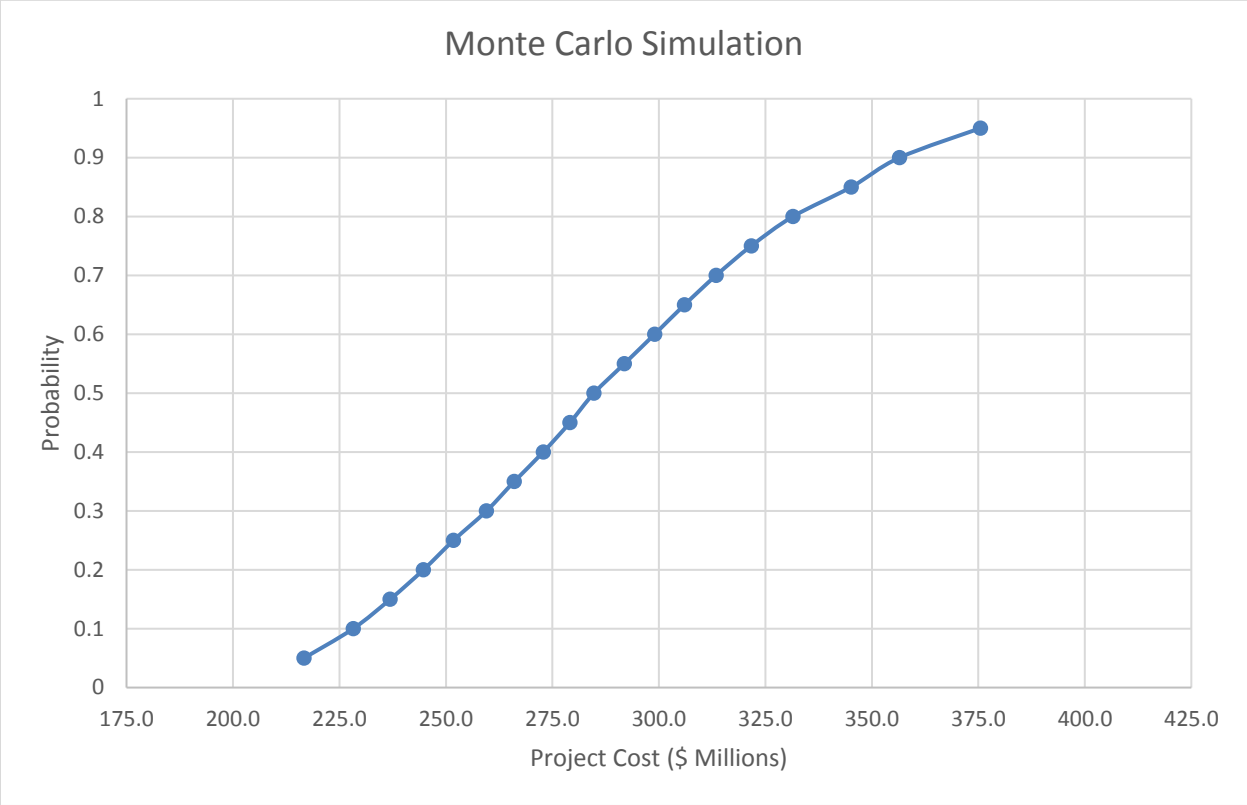


Table 5-12: Summary of Monte Carlo Simulation (2018$) [37]

Estimate	Value - millions	Contingency %
Base Estimate	$244.245	0%
P50	$284.753	17%
P53 (mean)	$288.721	18%
P70	$313.435	28%
P90	$356.488	46%

5.3.4.4 Conclusion from Risk Assessment Results

In summary, Validation Estimating's analysis predicts a contingency value similar to the 18 percent value derived by combining the Stantec's and Bramcon's simulation of the most likely number of restrictive bends at the P50 confidence level. The output of the check and benchmarking analysis conducted by Validation Estimating indicates that a contingency of approximately 17 percent is required to achieve a P50 confidence level.

For the purposes of its contingency and management reserve, FEI used the output of the Monte Carlo Simulation conducted by Validation Estimating as it was satisfied that the analysis by Mr.

[37] Base Estimate excluded GST on material discussed in Section 5.3.2.2. Including GST on material is $246.054 million.

Hollmann was more indicative of the range of risk outcomes for the Project over a multi year timeframe.

As a result, FEI's recommended contingency for the Project is 17 percent at the P50 confidence level. Contingency is typically expected to be spent and is used as an allocation for risks that are known and likely to be encountered during Project execution with a relatively high level of certainty. For a project that is executed over multiple years, however, there are certain risks that can occur but are relatively unknown and have a low likelihood of occurrence but the occurrence of which could have high consequences. To account for these risks, typically called system risks, and based on the analysis conducted by Validation Estimating, the addition of a management reserve of 11 percent (totalling 28 percent together with contingency) is considered prudent. This additional 11 percent approximates the P70 confidence level estimated by Validation Estimating.

5.4 CONSTRUCTION AND OPERATING SCHEDULE AND ACTIVITIES

The preliminary Project schedule is based on receiving BCUC Project Approvals by October 2019 and an assumed construction start of Q2 2020. The schedule considers performance of the site work between the months of April and October.

The Project activities will be subdivided into six main groups:

1. Contractor evaluation, selection and Contract award;
2. Permitting;
3. Engineering detailed design;
4. Procurement / manufacturing;
5. Mobilization to site; and
6. Fabrication and Site installation.

Table 5-13: Inland Gas Upgrades Project Schedule and Milestones

Activity	Date
CPCN Preparation	Aug 2017 - Dec 2018
CPCN Filing	Dec 2018
CPCN Approval	Oct 2019
Contractor Selection and Award	
Procure Engineering Services	June 2019 – Oct 2019
Contractor Tendering and Contract Negotiation – ILI	Aug 2019 – Dec 2019
Contractor Selection and Contract Negotiation – PLR & PRS	Jan 2020 – Dec 2020
Permitting for Assemblies*	
OGC Permits	Mar 2019 - Oct 2022
Indigenous Communities Consultation	Mar 2019 - Oct 2022
ALC Permits	Mar 2019 - Oct 2022
Federal Permits (Department of Fisheries and Oceans, Species at Risk Act)	Oct 2019 - Oct 2022
Railway Crossing Permits	Oct 2019 - Oct 2022
Ministry of Transportation and Infrastructure Permits	Oct 2019 - Oct 2022
Municipal Permits	Oct 2019 - Oct 2022
Utility Permits	Oct 2019 - Oct 2022
Environmental and Archaeological Permits	Oct 2019 - Oct 2022
Permitting for Bends, PRS, PLR	
OGC Permits	Oct 2019 - Oct 2022
Indigenous Communities Consultation	Oct 2019 - Oct 2022
ALC Permits	Oct 2019 - Oct 2022
Federal Permits (Department of Fisheries and Oceans, Species at Risk Act)	Oct 2019 - Oct 2022
Railway Crossing Permits	Oct 2019 - Oct 2022
Ministry of Transportation and Infrastructure Permits	Oct 2019 - Oct 2022
Municipal Permits	Oct 2019 - Oct 2022
Utility Permits	Oct 2019 - Oct 2022
Environmental and Archaeological Permits	Oct 2019 - Oct 2022
ILI	
Preliminary Land Negotiation - Option to Purchase	Dec 2018 – Sept 2019
Land Acquisition	Oct 2019
Engineering Detailed Design	Dec 2018 – Jan 2019
Procurement and Manufacturing	
Long Lead Items	Mar 2019
Bends and Piping	Q3 2019
Fabrication	Jan 2020
Mobilization to Site	Mar 2020

Activity	Date
Site Installation	
Construction	Apr 2020 - Aug 2024
All ILI Laterals In Service	Aug 2024
Restoration and Demobilization	May 2021 - Sept 2024
PLR	
Preliminary Land Negotiation - Option to Purchase	Dec 2018 – Sept 2019
Land Acquisition	Oct 2019
Engineering Detailed Design	Jan 2020
Procurement and Manufacturing	
Piping	July 2020
Mobilization to Site	May 2021
Site Installation	
Construction	Jun 2021 – Oct 2022
All PLR Laterals In Service	Oct 2022
Restoration and Demobilization	May 2022 - July 2023
PRS	
Preliminary Land Negotiation - Option to Purchase	Dec 2018 – Q3 2019
Land Acquisition	Oct 2019
Engineering Detailed Design	Jan 2021
Procurement and Manufacturing	
Long Lead Items	Mar 2021
Piping	July 2021
Fabrication	Nov 2021
Mobilization to Site	Mar 2022
Site Installation	
Construction	Apr 2022 – Sept 2024
All PRS Laterals In Service	Oct 2024
Restoration and Demobilization	May 2023 - Nov 2024

** Permitting schedules vary between laterals due to differing construction schedules, but approvals and permits will be sought at least six months prior to construction*

The activities will be grouped based on the preferred alternative. A more detailed schedule is included as Appendix M.

5.4.1 Contractor Selection and Award

Given the scale and scope of the Project, FEI will use a project delivery method that utilizes separate contracts for engineering design and construction. The engineering design will be completed using a services contract for the complete design and development of bid packages.

These bid packages will then be used to seek tenders from contractors for the construction of the works. Depending on the results of the tendering process, one or more construction contracts will be awarded.

5.4.2 Permitting

The permitting requirements will vary amongst laterals due to the different scope of each alternative. The list of permits for the Project that are expected are listed above in Table 5-13, and are explained in further detail in Section 5.7. The permits are split into two phases, assemblies (LA, RA, CVA, MLVA) and bends, PLR and PRS. The assemblies permits will be sought beginning in March 2019 in order to secure Land Rights based on the land management plan as discussed in 5.4.7. The permits for the bends, PLR and PRS will be sought beginning in October 2019. Permits including BC OGC, Ministry of Transportation, Agricultural Land Reserve, municipal, utility, environmental and archaeological will be identified and application processes initiated during engineering detailed design.

5.4.3 Engineering Detailed Design

Design activities will encompass all engineering calculations, validations, preparation of drawings and bid packages required to cover the Project needs. Some early engineering detailed design will commence in December 2018 due to the anticipated lead times for materials such as valves that are required in order to meet the proposed construction schedule. Engineering activities will be organized in order of priority, in relation to the fabrication/procurement lead times and scheduled date for each of the laterals.

Engineering designs to be completed are:

- ILI modifications (LA, RA, CVA, MLVA, bend and tee replacements, stopple upgrades);
- PLR alignment sheets and pipe specifications; and
- PRS components (Control valves, filters, telemetry, buildings and piping).

The engineering design activities will be completed by a consulting engineering firm acceptable to FEI. The design phase will be concluded by the final design review for each lateral, and the issued for construction drawings.

5.4.4 Procurement and Manufacturing

Given the long lead times for the some materials, an order for the amount needed for the 2020 scheduled work on three laterals will be made in March 2019. The remaining items for the Project will be procured beginning in October 2019 as needed.

5.4.5 Mobilization

Site mobilization will commence in March 2020 and will be ongoing due to the different construction schedules of all 29 laterals.

5.4.6 Fabrication

The major assemblies of the ILI laterals (LA, RA, CVA, MLVA) and the PRS skid mounted design will be fabricated in shops for their respective laterals. The PLR laterals will have little to no shop fabrication.

5.4.7 Site Installation

The duration of construction for each of the alternatives will vary due to the difference in scope amongst the laterals. The expected construction time frame for the entire Project is from April 2020 to September 2024.

5.4.8 Land Acquisition

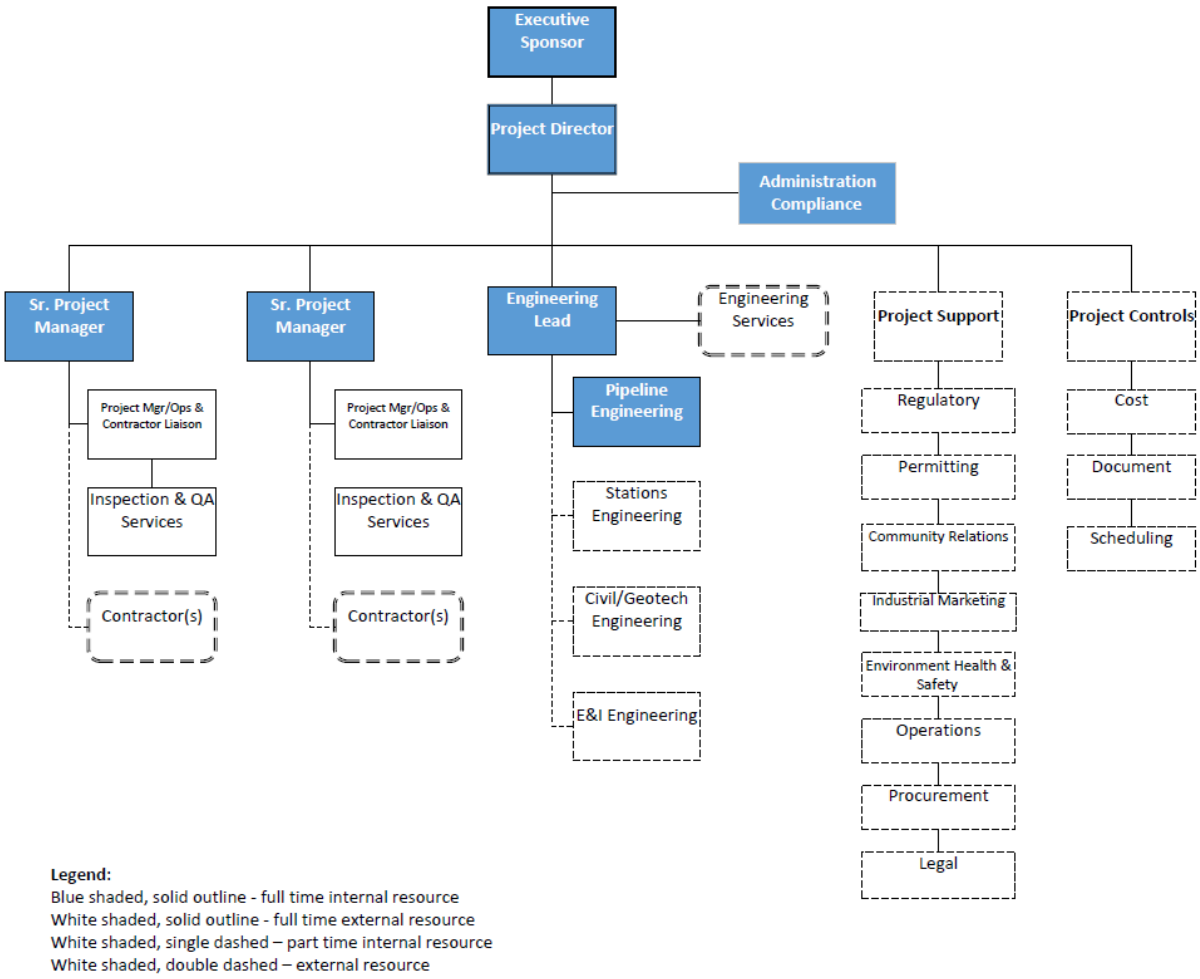
The Project will require fee-simple land acquisition, expanded ROW, temporary construction working space and access rights (Land Rights). FEI will develop a land management plan to assess the required properties and prioritize the acquisitions based on risk and impacts to the schedule. In order to reduce the potential uncertainty associated with securing Land Rights, FEI will enter into an early Option to Purchase Agreement with affected landowners beginning in March 2019 based on the land management plan. Upon granting of the CPCN, FEI will complete the acquisition of Land Rights with all affected landowners.

5.5 *PROJECT RESOURCES*

5.5.1 Project Management and Human Resources

Figure 5-4 outlines a functional organization chart for the execution of the Project. The project will be managed by FEI's Project management team and will include both internal and external personnel and use external engineering resources as required.

Figure 5-4: Proposed Resources and Organizational Chart for Inland Gas Upgrades



The Executive Sponsor for the execution of the Project is the Vice President, Major Projects.

5.6 *PROJECT IMPACTS OR EFFECTS IDENTIFIED*

5.6.1 Environmental

Site specific environmental management plans will be developed prior to construction to manage potential environmental risks associated with the proposed construction activities and site conditions. Below are the potential impacts expected as a result of the Project.

5.6.1.1 Physical Environment

Possible impacts to the physical environment include the potential for discharge of deleterious substances to water and soil during the installation of the HDDs, and directional boring for shorter crossings. Hazardous and non-hazardous wastes generated will be managed appropriately including storage, containment, labelling, transport and disposal.

5.6.1.2 Ecological Environment

The Project design options are all located within or directly adjacent to existing ROW. The 29 Transmission Laterals overlap with watercourses, patches of mature trees, and areas with potential for plant communities at risk. Habitat for wildlife or plant species at risk overlaps with 24 of the 29 Transmission Laterals. Over 37 species of invasive plants are present in areas of existing disturbance along the laterals, especially near urban areas.

Project design options were assessed for their potential impacts or effects on the ecological environment and options were selected to minimize disturbance to sensitive environmental features. Best practices will be applied to minimize any remaining potential negative impacts or effects on the environmental. Invasive plant management will be applied throughout Project construction to minimize the potential spread or introduction of invasive plants. Some vegetation removal will be required during site preparation and construction.

Contaminated sites may be present along some laterals. Preliminary surveys identified the location and nature of potential contaminated sites. Further studies will be completed prior to construction to identify appropriate handling and disposal techniques.

5.6.1.3 Cultural Resources

Archaeological potential for the majority of the Project is generally low. Specific sites were identified as having moderate to high archaeological potential. Four known sites are located within 100m of the Project, and areas with moderate to high potential for deeply buried cultural deposits are present along 13 of the laterals.

Project design options were assessed for potential impacts to archaeological resources and Archaeological Impact Assessments will be completed prior to construction. Archaeological monitoring will take place during construction where there is moderate to high potential for deeply buried cultural deposits to minimize the potential impact to archaeological resources.

5.6.2 Socio-Economic Overview

As part of the Project's overall impact and risk assessment, FEI completed a socio-economic assessment.

The Project will result in an overall positive impact to residents and businesses through the creation of additional employment within the Project scope, and the procurement of local materials and the use of local services, such as local lodging and dining. The Project will limit the potential for a loss or a disruption of gas supply and will improve the reliability of the natural gas system. Short-term disruption effects of the Projects are expected to be temporary and generally minor. Some of these impacts include minor traffic delays, access restrictions to sections of a public park and temporary parking restrictions to sections of business parking lots. FEI does not anticipate long term negative impacts as a result of the Project.

Because the majority of the work will take place within existing ROWs, this will reduce the amount of impacts to the surrounding areas. While PLR will require widening of ROWs, the land uses adjacent to those laterals for which PLR is the preferred alternative are largely rural (low population density), commercial (one business parking lot), parks/open space, and recreation (i.e., golf course, municipal parks).

FEI reviewed the routes along each lateral and identified adjacent rural/sub-urban communities, First Nations land, small business and farmland. Potential effects to business activity during construction will include minimal disturbances and very minimal traffic delays. Construction activities for PLR have the potential to disturb some nearby residents and users of recreation space, such as KA1 LTL, a 3.6 kilometre lateral crossing a municipal park in the City of Kamloops, and SA3 LTL, a 0.8 kilometre replacement that will cross the local golf course, Canoe Creek Golf Course.

FEI's plans to mitigate, manage and minimize potential adverse effects and monitor Project impacts as construction proceeds. The mitigation measures will be based on industry best practices and applicable requirements of local regulations. Mitigation measures will include, for example, complying with municipal noise bylaws and limiting traffic access restrictions to businesses and residents during construction. Stakeholder and Indigenous community impacts and proposed mitigation activities to minimize impacts identified through FEI's consultation process with stakeholders and with Indigenous communities are described in Section 8 of the Application.

There is the potential for positive employment impacts that will contribute to the local economy in the BC Interior, as new jobs may be generated during the construction period. There is also the potential for economic spin-offs to be created, such as increased demand for local hospitality services (i.e. the use of local hotels and restaurants for employees working on the construction sites). FEI also does not expect that the Project will impact other utility or infrastructure construction along any of the 29 Transmission Laterals.

In summary, the Project is not expected to have any negative, long-term effects on the socio-economic conditions in the area. FEI anticipates some positive socio-economic benefits to the regional areas as a result of the Project, based on the assessment and experience with previous projects of this nature.

5.7 *REQUIRED PERMITS AND APPROVALS*

5.7.1 Federal

Federal notifications and approvals may be required to comply with the provisions of the *Fisheries Act*. The construction of the Project will require Species at Risk Act permits and Navigation Protection Act review or notification.

Species at Risk Act Section 73 permits may be required for works associated with three laterals: KA1 LTL, KBY LTL, and SSK LTL. Authorizations under the Fisheries Act may be required for works associated with seven of the laterals: MAC LTL, SAL LOP, COL LOP, FRD LTL, CRK LOP 273, KBY LTL, and SSK LTL. Federal permit and authorization requirements will be reviewed during detailed Project design.

5.7.2 Provincial

5.7.2.1 BC Oil and Gas Commission

The construction and operation of the Project are governed by the Oil and Gas Activities Act. The Project will require Pipeline Applications for all 29 Transmission Laterals. FEI plans to file the Pipeline Applications in 2020. A Pipeline Application is a significant process with considerable technical scrutiny on the Project by the BC OGC. Public and First Nations consultation, ROW acquisition, land acquisitions, land or access rights, archaeological requirements, design reviews, environmental permits/approvals for work in and around fish bearing streams are all components of the Pipeline Application. Each component must receive BC OGC approval prior to the start of construction. Since the proposed pipeline replacements and modifications will generally follow existing pipeline routes, the current schedule assumes a 6-month approval period from the time of filing.

The Project will impact Crown Land and in some areas, require additional ROW on Crown Land. These Crown Land requirements will be developed for each lateral as part of the lateral's BC OGC Pipeline Application during the detailed design stage.

5.7.2.2 Other Provincial Permits

The construction of the Project will require the following Provincial permits:

- *Water Sustainability Act*, Section 11 notification or permit
- *Water Sustainability Act*, Section 10 permit
- *Wildlife Act*, General Wildlife permit
- *Wildlife Act*, Fish Salvage permit
- *Heritage Conservation Act*, Section 12 permit.

5.7.3 Municipal

Pipeline construction will require municipal permits to ensure construction and installation meets municipal bylaws and guidelines. FEI is currently in the process of identifying all required municipal permits and will determine requirements during detailed design and acquire them prior to commencing construction. The terms and conditions outlined in these permits and approvals will be adhered to during the construction of the Project.

5.7.4 Permits, Licenses or Authorizations

5.7.4.1 Ministry of Transportation and Infrastructure Permits

Highways and areas under the jurisdiction of the Ministry of Transportation and Infrastructure will require permits. Once the extent of the impact is determined during detailed design, permits will be prepared and submitted for approval. The terms and conditions outlined in these permits will be adhered to during the construction of the Project.

5.7.4.2 Railway Crossing Permits

The Project expects pipe installation or modification with crossings of railways owned by British Columbia Railway, Canadian National Railway, and Canadian Pacific Railway. Once the scope of the crossings is determined during detailed design, appropriate permits will be prepared and submitted for approval. The terms and conditions outlined in these permits will be adhered to during the construction of the Project.

5.7.4.3 Agricultural Land Reserve

The construction of the Project may also affect Agricultural Land Reserve regions. Once the extent of the impact to Agricultural Land Reserve has been determined, applications will be prepared and submitted for approval to the Agricultural Land Commission. The terms and conditions outlined in these approvals will be adhered to during the construction of the Project.

5.7.4.4 Other Utilities

The Project will result in construction activities in proximity to existing adjacent utilities. Liaison with all stakeholders combined with onsite investigations will address stakeholders concerns during detailed design and engineering.

5.7.4.5 Other Pending or Anticipated Applications/Conditions

A qualified environmental professional working in conjunction with the Company's Environmental Affairs group will assist the Project in identifying permits/approvals required in the development of an Environmental Protection Plan for the Project.

The Project is not expected to require an Environmental Assessment Certificate pursuant to the *British Columbia Environmental Assessment Act*.

Agency notifications, permits or approvals are anticipated under, but not limited to, the Fisheries Act, Species at Risk Act, Water Sustainability Act, and Heritage Conservation Act. Notifications, permits or approvals may also be required from the Agricultural Land Commission. The terms and conditions outlined in these permits and approvals will be adhered to during the construction of the Project.

5.8 CONCLUSION

In this section, FEI described the proposed Inland Gas Upgrades Project in detail, including information on Project components for each alternative, schedule, resource requirements, risks and management, and permitting and approval requirements.

6. PROJECT COSTS, ACCOUNTING TREATMENT AND RATE IMPACT

6.1 *INTRODUCTION*

The total cost estimate of the IGU Project is $363.895 million (as-spent) which includes $362.904 million (as-spent) of capital costs that forms the Project capital budget and $0.991 million (as-spent) of Project deferral costs. This section provides a breakdown of the Project cost by lateral, summarizes financial analysis and details the accounting treatment and rate impact. Also sets out below, FEI is requesting approval of deferral treatment of the Application and Preliminary Stage Development Costs for the Project.

6.2 *SUMMARY OF PROJECT COSTS AND INCREMENTAL COST OF SERVICE*

Table 6-1 summarizes the estimated total Project cost including the Project capital budget and the Project deferral cost in 2018 and as-spent dollars. The Project capital budget in 2018 dollars includes PST on the materials, contingency and management reserve. The Project capital budget in as-spent dollars is based on an annual inflation forecast of two percent as discussed in Section 5.3.2.1 of the Application and the construction schedule in Section 5.4 of the Application. As discussed in Section 5.3.2 of the Application, the total Project capital budget estimate includes a contingency of 17 percent and a management reserve of 11 percent which together will provide a total Project capital budget that approximates a P70 confidence level.

Table 6-1: Total Project Cost: Summary of Forecast Capital and Deferred Costs ($millions)

	2018 $	As-Spent $	AFUDC	Tax Offset	TOTAL
Type of Preferred Option					
In-line Inspection (ILI) - 11 Laterals	241.204	258.095	10.903	-	268.998
Pipeline Replacement (PLR) - 4 Laterals	28.414	30.427	1.323	-	31.750
Pressure Regulating Station (PRS) - 14 Laterals	53.388	58.635	3.197	-	61.831
Total Addition to Plant - Total 29 Laterals	323.006	347.157	15.422	-	362.579
Abandonment/Demolition Cost	0.290	0.311	0.014	-	0.325
Subtotal - Project Capital Budget	*323.296*	*347.468*	*15.436*	*-*	*362.904*
IGU Project Application Cost	0.390	0.390	0.008	(0.105)	0.293
IGU Project Preliminary Stage Development Cost	0.931	0.931	0.019	(0.251)	0.698
Subtotal - Project Deferral Cost	*1.321*	*1.321*	*0.027*	*(0.357)*	*0.991*
TOTAL Project Cost	***324.617***	***348.789***	***15.463***	***(0.357)***	***363.895***

The Project consists of construction to enable ILI for 11 laterals, PLR for four laterals, and PRS for 14 laterals. Table 6-2 below provides the breakdown of the Project capital costs (excluding Project deferral costs) by the 29 Transmission Laterals.

Table 6-2: Breakdown of Project Capital Budget by Laterals

Ref	Lateral	2018 $	As-Spent $
In-line Inspection (ILI) - 11 Laterals			
1	Mackenzie Lateral 168	36.001	39.056
2	Mackenzie Loop 168	20.053	22.437
7	Prince George #1 Lateral 168	10.555	11.975
14	Salmon Arm Loop 168	26.333	30.392
22.1	Fording Lateral 219	49.293	54.932
22.2	Fording Lateral 168	34.596	38.734
24	Cranbrook Lateral 168	14.395	15.652
25	Cranbrook Loop 219	12.456	13.584
26	Cranbrook Kimberley Loop 219	6.186	6.807
27	Cranbrook Kimberley Loop 273	7.046	7.932
28	Kimberly Lateral 168	17.412	19.612
29	Skookumchuck Lateral 219	6.929	7.942
	Subtotal - ILI	***241.255***	***269.055***
Pipeline Replacement (PLR) - 4 Laterals			
3	BC Forest Products Lateral 168	4.231	4.663
11	Cariboo Pulp Lateral 168	4.838	5.332
13	Kamloops 1 Lateral & Loop 168	15.942	18.008
15	Salmon Arm 3 Lateral	3.642	4.014
	Subtotal - PLR	***28.653***	***32.018***
Pressure Regulating Station (PRS) - 14 Laterals			
4	Prince George 3 Lateral 219	1.547	1.753
5	Northwood Pulp Lateral 168	1.553	1.760
6	Northwood Pulp Loop 219	1.551	1.758
8	Prince George Pulp Lateral 168	2.596	2.938
9	Husky Oil Lateral 168	2.597	2.939
10	Prince George #2 Lateral 219	4.555	5.157
12	Williams Lake Loop 168	4.387	5.066
16	Coldstream Lat 219	4.358	5.029
17	Coldstream Loop 168	4.420	5.102
18	Kelowna 1 Loop 219	5.105	5.891
19	Celgar Lateral 168	4.564	5.376
20	Castlegar Nelson 168	7.051	8.343
21	Trail Lateral 168	4.585	5.399
23	Elkview Lateral 168	4.520	5.319
	Subtotal - PRS	***53.388***	***61.831***
	TOTAL Project Capital Budget	***323.296***	***362.904***

As discussed in Section 5 of the Application, the cost estimate for each lateral was developed in accordance to AACE 18R-97 Class 3 specifications as required by the CPCN Guidelines.

Table 6-3 presents the financial evaluation of the Project over a 66-year period (60 years post-Project and 6 prior years during the Project)[38]. The present value of the net cash flow of the Project represent (0.99%) of the present value of the incremental revenue requirement over 66 years[39]. Details of the financial evaluation of the Project as well as of each individual lateral can be found in the Financial Schedules as included in Confidential Appendices N-1 and N-2.

Table 6-3: Financial Analysis of the Project

	ILI	PLR	PRS	TOTAL
Number of Laterals per Type of Preferred Option	11	4	14	***29***
Total Charged to Gas Plant in Service ($ millions)	268.998	31.750	61.831	***362.579***
Abandonment / Demolition Costs ($ millions)	0.058	0.268	-	***0.325***
Total Project Deferral Cost	0.376	0.137	0.478	***0.991***
Total Project Cost ($ millions)	***269.431***	***32.154***	***62.310***	***363.895***
Rate Impact in 2025, when all assets enter Rate Base (%)	3.31%	0.29%	0.71%	***4.31%***
Levelized Delivery Rate Impact 66 years (%)	2.33%	0.22%	0.52%	***3.06%***
Levelized Delivery Rate Impact 66 years ($/GJ)	0.094	0.009	0.021	***0.124***
PV of Incremental Revenue Requirement 66 years ($ million)	320.577	29.898	71.615	***422.090***
Net Cash Flow NPV 66 years ($ million)	(1.67)	(1.04)	(1.48)	***(4.19)***

6.3 *ACCOUNTING TREATMENT*

6.3.1 Treatment of Capital Costs

Consistent with FEI's treatment of CPCNs, the capital costs of the Project (i.e. the costs included in the subtotal "Project Capital Budget" in Table 6-1 above) will be held in Work in Progress, attracting AFUDC[40]. Construction of the Project is scheduled to be completed in multiple phases and the specific assets with construction work completed in each phase will be placed in service when they are commissioned and ready to be used. FEI will transfer the associated capital costs of the specific assets that have been placed in service to the appropriate plant asset accounts and include in FEI's rate base on January 1 of the following year. Depreciation of the assets included in FEI's rate base will begin at the start of the year.

Table 6-4 below summarizes the estimated amount of Project capital costs associated with the specific assets that will be completed and placed in service in each phase of the Project from

[38] The 60-year post-project analysis period was chosen based on the currently approved depreciation rate of Transmission Main pipeline at 1.47% (or 68 years) since the majority of the capital expenditure, especially for ILI and PLR, are tracked under the Transmission Main pipeline asset. For simplicity, the analysis period for post-project is rounded down to 60 years considering it still covers approximately 90 percent of the depreciation life of a Transmission Main pipeline. The 6 prior years is based on the construction schedule of the Project from 2019 to 2024.

[39] The minor variance from zero is expected and is primarily due to small difference between the assets' lives and the 66-year analysis period used, and some timing differences in earnings, taxes, and depreciation. The near zero variance indicates the financial analysis used to evaluate the Project was completed appropriately as FEI is only recovering the allowable earnings and the cost of service over the life of the assets.

[40] FEI's 2018 AFUDC rate is 5.61%, which is equal to the after-tax weighted average cost of capital.

2019 to 2024[41]. The same amount of Project capital costs that are placed in service in each year will be transferred to the opening balance of FEI's plant-in-service on January 1 of the following year. The amount and timing of the transfer to the plant asset account for each year is also identified in Confidential Appendix N-1, Financial Schedule 7 for the overall Project as well as Confidential Appendix N-2, Financial Schedule 7 (Preferred Option) of each individual lateral. The subsequent sections will discuss the regulatory accounting treatment of the abandonment/demolition costs and the Project deferral costs.

Table 6-4: Percentage of Project Complete and In-Service during Project Years (2019 to 2024)[42]

	Project complete and in-service each year, 2019-2024 ($ millions) (To be transfer to Rate Base January 1 of each following year)						
	2019	2020	2021	2022	2023	2024	TOTAL
In-line Inspection (ILI) - 11 Laterals	-	51.034	76.549	65.629	52.430	23.412	**269.055**
Pipeline Replacement (PLR) - 4 Laterals	-	-	11.374	18.864	1.780	-	**32.018**
Pressure Regulating Station (PRS) - 14 Laterals	-	-	-	14.979	20.859	25.993	**61.831**
Overall Project Capital Budget In-Service	*-*	*51.034*	*87.923*	*99.471*	*75.070*	*49.406*	*362.904*
Overall Project % In-Service	0%	14%	24%	27%	21%	14%	**100%**

6.3.2 Net Salvage

Abandonment/demolition costs related to the existing laterals will be charged to FEI's existing Net Salvage Deferral Account in accordance with the approved treatment of these costs as approved in Order G-44-12. The abandonment/demolition costs for the Project overall are forecast to be $0.290 million (2018 dollars) or, in as-spent dollars, $0.325 million (including AFUDC of $0.014 million). These costs are identified in Confidential Appendix N-1, Financial Schedule 9 for the overall Project. For abandonment/demolition costs associated with the construction work of each individual lateral, please refer to Financial Schedule 9 of each individual lateral in Confidential Appendix N-2.

6.3.3 Application and Preliminary Stage Development Costs

FEI is seeking BCUC approval under Sections 59-61 of the Act for deferral treatment of the Application and Preliminary Stage Development costs. The Application costs include expenses for legal review, consultant costs, BCUC costs and BCUC-approved intervener costs and are based on a written hearing process. The Preliminary Stage Development costs are related to expenses incurred by FEI internally and also for engaging third-party consultants for feasibility evaluation, preliminary development and assessment of the potential design and alternatives as required to complete this CPCN Application. FEI is seeking approval to record these costs in a new non-rate base deferral account, the IGU Application and Preliminary Stage Development

[41] The amount of Project capital cost as well as the percentage in each year estimated to complete and in service is not the same as the construction schedule as discussed in Section 5.4 of the Application. The percentage of work estimated to complete is based on the nature of the specific work in each year that is complete and can be placed in-service.

[42] The percentages are not additive in rows. The percentage for each type of construction as well as the overall project are calculated based on the total capital costs of each construction type. E.g. 9 percent of ILI work to be in service in 2020 is not equivalent to the 9 percent of all construction work in 2020 that includes PLR and PRS.

Costs Deferral Account, attracting FEI's weighted average cost of capital until it enters rate base. FEI proposes to transfer the balance in the deferral account to rate base on January 1, 2020 and commence amortization over a three-year period.

Table 6-5 below shows the December 31, 2019 net-of-tax balance for the Application cost and the Preliminary Stage Development cost are forecast to be $0.293 million and $0.698 million, respectively.

Table 6-5: Forecast Deferred Regulatory Application Costs and Preliminary Stage Project Development Costs ($ millions)

Particulars	As-Spent ($ millions) Application	Preliminary Stage Development	TOTAL
Costs	0.390	0.931	1.321
WACC Return	0.008	0.019	0.027
Total Before Tax Offset	***0.398***	***0.950***	***1.348***
Tax Offset	(0.105)	(0.251)	(0.357)
Total	***0.293***	***0.698***	***0.991***
Annual Amortization for 3 years	(0.098)	(0.233)	(0.330)

6.4 *RATE IMPACT*

As discussed in Section 6.3.1, FEI will complete the Project in multiple phases between 2019 and 2024. Combined with the amortization of the deferral costs beginning in 2020 as discussed in Section 6.3.3, the impact to customer delivery rates will occur incrementally in each year from 2020 to 2025[43]. Table 6-6 shows the annual delivery rate impact in percentage compared to the 2018 approved non-bypass revenue requirement (Commission Order G-196-17) and the incremental annual delivery rate impact in percentage (year-over-year) from 2020 to 2025.

Table 6-6: Summary of Rate Impact for the Inland Gas Upgrades Project

	2020	2021	2022	2023	2024	2025
Annual Revenue Requirement, Incremental to 2018 Approved, Non-Bypass ($ millions)	(0.169)	2.909	9.898	19.249	28.396	34.291
% Increase to 2018 Approved Revenue Requirement, Non-Bypass (G-196-17)	***(0.02%)***	***0.37%***	***1.24%***	***2.42%***	***3.57%***	***4.31%***
Incremental % Rate Impact (Year-over-Year)	***(0.02%)***	***0.39%***	***0.88%***	***1.16%***	***1.12%***	***0.72%***
Average Annual % Delivery Rate Impact (6 years, 2020-2025)	0.71%					
Average Annual Delivery Rate Impact (6 years, 2020-2025), $/GJ	0.029					
Cumulative % Delivery Rate Impact (6 years, 2020-2025)	4.31%					
Cumulative Delivery Rate Impact (6 years, 2020-2025), $/GJ	0.175					

The Project will result an estimated delivery rate impact of 4.31 percent in 2025 when all construction is completed and all assets are placed in service in 2024. The average annual delivery rate impact over the six Project years is estimated to be 0.71 percent annually or

[43] There is no rate impact in 2019, as discussed in Section 6.3.1, the specific assets complete and in-service will be transferred to rate base on January 1 of the following year. Therefore, the first year of delivery rate impact due to the Project is 2020 as a result of the amortization of the deferral costs, which is entirely offset by the Capital Cost Allowance in the Income Tax expense in 2020.

$0.029 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an approximate average increase of $2.63 per year over the six years, or cumulatively $15.77 over the six years.

7. ENVIRONMENT AND ARCHAEOLOGY

7.1 INTRODUCTION

FEI has assessed the environmental and archaeological impacts for the 29 Transmission Laterals included in the IGU Project. Based on the assessments undertaken for the Project, the Project is expected to have minimal environmental and archaeological impact. Potential impacts of the Project can be mitigated through the implementation of standard best management practices. Impacts to construction timelines and costs as a result of encountering species at risk, fish habitat, or contaminated soil or groundwater can be minimized through additional investigations pre-construction. The Project areas were assessed for archaeological potential, and Archaeological Impact Assessments (AIA) have been recommended for areas assessed as having moderate to high archaeological potential.

7.2 ENVIRONMENT

FEI retained Hemmera Envirochem Inc. (Hemmera)[44] to complete an Environmental Overview Assessment (EOA) of the Project.

The assessment is based on a combination of desktop review of available information and preliminary field reconnaissance (PFR) surveys. The assessment was completed to identify and describe the potential impacts to the biophysical environment from the Project and determine recommended mitigation. Detailed descriptions of Project related biophysical impacts and recommended mitigation can be located in Section 6 of the EOA (Appendix O). The results of the overview assessment will inform further detailed assessments and the preparation of environmental management plans to be completed following the approval of this Application by the BCUC and prior to the commencement of Project construction. The assessment reviewed all 29 Transmission Laterals considered for the Project. The laterals were reviewed in their entirety and the impacts assessed based on the expected footprint of construction.

The Project impacts vary by site but include disturbance to environmental features such as terrestrial and aquatic resources, species at risk, and soils. In this section, FEI describes its approach and plan with respect to the identification, management, and mitigation of environmental impacts. FEI is committed to delivering safe, reliable energy in an environmentally responsible manner to all the communities that we serve.

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

[44] Hemmera is a multi-discipline consulting company that provide professional expertise in environmental sciences, social sciences, and engineering.

7.2.1 Environmental Overview Assessment

The results of the work completed by Hemmera are outlined in the Inland Gas Upgrades Environmental Overview Assessment Report (Environmental Overview Assessment included as Appendix O). The assessment includes the following areas:

- Current land use;
- Contaminated sites (soil and water);
- Terrestrial resources;
- Aquatic resources; and
- Species at risk.

The EOA identifies significant natural features, such as fish, wildlife, and terrestrial habitat that could potentially be impacted by Project construction as well as areas that could impact the construction, costs, and timelines of the Project. The EOA also identifies land use and locations with potential for encountering soil or trench water (groundwater) contamination which may impact Project construction, costs, and timelines. These potential impact areas are summarized in the following sections. Section 6 of the EOA report (Appendix O) identifies proposed best management practices and mitigation measures to minimize impacts to significant natural features.

Significant land use, natural features, and potential contamination areas identified in the EOA report as having potential to overlap interact with the Project:

- Agricultural land reserve (ALR) lands overlap with the Project footprint of 14 laterals;
- 4 parks/conservation areas are crossed by the expected Project footprint;
- 47 areas of potential environmental concern related to contaminated sites, mostly associated with historical or current industrial activities;
- 3 ungulate winter ranges (UWR) overlap with the expected Project footprint;
- 6 wildlife habitat areas (WHA) overlap with the expected Project footprint;
- Wildlife trees;
- Active osprey nests near 6 laterals;
- A great blue heron rookery adjacent to the SAL LOP lateral;
- 9 plant species at risk in or adjacent to the expected Project footprint;
- 1 plant community at risk in or adjacent to the expected Project footprint;
- 37 species of invasive plants along 24 laterals. Coverage and density varies between laterals. 5 laterals are free of invasive plants;

- 53 watercourses, fish-bearing or directly connected to fish-bearing waters, in close proximity to the expected Project footprint;
- 6 fish species at risk in waterways crossed by or in close proximity to the expected Project footprint;
- Critical Habitat federally identified for species at risk overlaps with the Project footprint of 8 laterals; and
- 16 wildlife species at risk have known occurrences in or close to the expected Project footprint.

7.2.1.1 Current Land Use

Land use varies across the 29 Transmission Laterals; however, the majority of the laterals are located in rural areas of central British Columbia and land use is primarily associated with rural communities, industrial activities (e.g. mining, forestry or pulp mills), grazing, or agriculture. Many of the laterals parallel existing highway and road systems. One Indian Reserve and four parks or protected areas overlap with the expected Project footprint.

- SAL LOP 168 – Enderby I.R. #2
- KA1 LTL & LOP 168 – Kenna Cartwright Nature Park (municipal park)
- CRK LOP 273 – Cranbrook Community Forest
- CRK LTL 168 – Phillips Reservoir (community watershed)
- FRD LTL 168/219 – conservation area (Nature Trust lands)

Soils, including interactions with ALR lands, are discussed in Section 7.2.1.2.

7.2.1.2 Soils

Of the 29 Transmission Laterals, 15 overlap with ALR lands, many areas of which are actively cultivated or currently used for grazing livestock. Soil classification ranges from agricultural capability class 1 through 7 where soils have been classified. Mitigation measures will be implemented to reduce impacts to soils during Project construction.

Contaminated soils information is provided in Section 7.2.1.3.

7.2.1.3 Contaminated Sites

Locations where there is a medium to high potential for encountering soil or groundwater contamination within the Project area may impact Project construction, cost, and timelines. These areas of potential are called Areas of Potential Environmental Concern (APECs) and are summarized in the Environmental Overview Assessment (Appendix O) and in Table 7-1. Forty-seven medium or high risk APECs are present along 21 of the 29 Transmission Laterals. Known

contaminated sites vary in type of contaminate, concentration of contaminates, and potential for interaction with the 29 Transmission Laterals.

Most of the APECs are associated with railway crossings, active industrial sites on private lands, or historical industrial use.

FEI will undertake further assessment of medium and high risk APECs during the detailed engineering phase of the Project to minimize the risk of these APECs on the Project costs and timelines.

Table 7-1: Registered Contaminated Sites and APECs overlapping with Project Laterals

Lateral	APEC ID (Site Reg. ID)	Name	Location
MAC LTL 168	A2	Automobile scrap yard	Cooper Rd, MacKenzie
MAC LTL 168	A5	Railway crossing	West of Coquiwaldie Rd, MacKenzie
MAC LTL 168	A6	Railway crossing	West of Coquiwaldie Rd, MacKenzie
MAC LTL 168	A7	Pile of railway ties	West of Coquiwaldie Rd, MacKenzie
MAC LTL 168	A8	Railway crossing	Old Airport Rd, MacKenzie
MAC LTL 168	A9	Railway crossing	North of Mischinsinlika Cr., MacKenzie
MAC LTL & LOP 168	A10/C1	Railway crossing	West of Hwy 39
BCF LTL 168	B1	MacKenzie Pulp Mill Corporation	1000 Coquiwaldie Rd, MacKenzie
BCF LTL 168	B2	Railway crossing	North of Coquiwaldie Rd, MacKenzie
PG3 LTL 219	F1	Railway crossing	Landooze Rd, PG
PG3 LTL 219	F2 (2135)	BC Gas Prince George	1221 Noranda Rd, PG
NWP LTL 168	D2	Railway crossing	North of Canfor PG Sawmill
NWP LTL 168	D3	Railway crossing	North of Beaver FSR, PG
NWP LOP 219	E2	Railway crossing	North of Canfor PG Sawmill
PGP LTL 168	H1	Railway crossing	South of Fraser Rv.
PGP LTL 168 & HUS LTL 168	H2/I1 (1329)	BC Gas Prince George Pulp Station	2789 Pulp Mill Rd, PG
HUS LTL 168	I4	Railway crossing	North of PG Pulpmill Rd, PG
CAR LTL 168	K1 (5296)	Cariboo Pulp and Paper	50 N Star Rd, Quesnel
WIL LP1 & LP2 168	L1	Airport hangar & maintenance	3020 Airport Rd, Williams Lake

Lateral	APEC ID (Site Reg. ID)	Name	Location
SAL LOP 168	N2	Sawmill operations	4051 45th St SE, Salmon Arm
SAL LOP 168	N4	Salmon Arm Industrial Park	45th St SE, Salmon Arm
SAL LOP 168	N5	Auto parts yard	4850 46 Ave SE, Salmon Arm
SA3 LTL 168	O1 (4473)	FortisBC pump station	6040 SE Auto Rd, Salmon Arm
COL LTL 219	P2	Railway crossing	West of Polson Dr., Vernon
COL LTL 219 and COL LOP 168	P3/Q1 (2561)	Coldstream Gate Station	13190 Reservoir Rd, Coldstream
KEI LOP 219	R4 (2475)	Kelowna Gate Station	1595 Spall Rd, Kelowna
CAS NEL 168	S3	Historical Castlegar Landfill	625 to 661 5th Ave., Castlegar
CAS NEL 168	S4	Boulder Patch Trucking	1071 Lazeroff Rd., Castlegar
CAS NEL 168	S6	Railway crossing	HWY 3A and Goose Creek Rd.
TRA LTL 168	T1 (2721)	BC Gas Warfield Station	Bingay Rd, Trail
FRD LTL 168 & 219	W1 (20872)	Independent remediation site	HWY 43, North of Sparwood
FRD LTL 168 & 219	W4	Service Station - Race Trac Gas	351 Alpine Way, Elkford
FRD LTL 168 & 219	W7	Railway Crossing	Fording FSR, South of Fording River Rd
FRD LTL 168 & 219	W8	Railway Crossing	Fording River Rd, South of Erwin Cr.
FRD LTL 168 & 219	W9	Railway Crossing	Fording FSR, East of Fording River Rd
FRD LTL 168 & 219	W11	Railway Crossing	South of Chauncey Creek, East of Fording River Rd
FRD LTL 168 & 219	W12	Coal Mining Operations - Teck Coal Ltd. Fording River	Fording River Rd
FRD LTL 168 & 219	U1	Railway Crossing	South of Corbin Rd
FRD LTL 168 & 219	U2	Railway Crossing	North of Corbin Rd
FRD LTL 168 & 219	U5	Railway Crossing	South of G North Road, North of Michel Creek, Sparwood
FRD LTL 168 & 219	U10	Railway Crossing	North of Elk Valley Hwy, East of Elk River, Sparwood
FRD LTL 168 & 219	U12	Railway Crossing	East of Elk Valley Hwy and West of Elk Rv, Sparwood
CRK LOP 273	X1	Railway Crossing	HWY 95A and Theatre Rd, Cranbrook

Lateral	APEC ID (Site Reg. ID)	Name	Location
KBY LTL 168	Y1/Z1	Kootenay Wood Preservers	4201 Echo Field Rd, Cranbrook
KBY LTL 168	Z2	Firing Range - Kimberley Trap and Skeet Club	9712 HWY 3 and HWY 95
KBY LTL 168	Z3	Former Kimberley landfill - current municipal transfer station	Fertilizer Rd, Kimberley
SSK LTL 219	AA2	Railway crossing	HWY 95

7.2.1.4 Terrestrial Resources

The 29 Transmission Laterals are spread out across the interior of the province and are located in the following biogeoclimatic zones:

- Bunchgrass (BG)
- Engelmann Spruce - Subalpine Fir (ESSF)
- Interior Cedar Hemlock (ICH)
- Interior Douglas Fir (IDF)
- Ponderosa Pine (PP)
- Montane Spruce (MS)
- Sub-boreal Spruce (SBS)

Three ungulate winter ranges for elk, mule deer, white-tailed deer, moose, bighorn sheep, and mountain goat overlap with the expected Project footprint and are associated with ten laterals.

- U-4-001 for elk, mule deer, white-tailed deer, and moose overlaps with CEL LTL 168, CAS NEL 168, and TRA LTL 168.
- UWR 4-006 for elk, mule deer, white-tailed deer, moose, bighorn sheep, and mountain goat overlaps with KBY LTL 168, CRK LTL 168, CRK LP2 219, SSK LTL 219, FRD LTL 168/219, and ELK LTL 168.
- UWR 4-008 for elk, mule deer, white-tailed deer, moose, bighorn sheep, and mountain goat overlaps with SSK LTL 219.

Five wildlife habitat areas for wildlife species of management concern overlap with the expected Project footprint and are associated with five laterals.

- WHA 8-373 for grizzly bear overlaps with CEL LTL 168, CAS NEL 168, and TRA LTL 168.

- WHA 4-180 for grizzly bear overlaps with CRK LTL 168.
- WHA 4-091 and 4-089 for American badger overlap with SSK LTL 219.
- WHA 4-068 for long-billed curlew overlap with SSK LTL 219

One occurrence of a sensitive ecosystem and provincially listed plant community overlaps with the Project and is present near the north end of SSK LTL 219, Antelope-brush / bluebunch wheatgrass (*Purshia tridentata* / *Pseudoroegneria spicata*). This occurrence is associated with WHA 4-117 for Antelope-brush / bluebunch wheatgrass plant community.

The EOA report describes the presence of other terrestrial resources on or near the expected Project footprint including stick nests, wildlife trees, and patches of mature forest. The EOA report also identifies permit requirements. FEI will undertake further assessment of terrestrial resources during the detailed engineering phase of the Project and will apply for permits where required.

Best management practices and mitigation measures to minimize and avoid potential negative effects of the Project on terrestrial resources are described in Section 6 of the EOA report, including:

- Apply best practices for managing invasive plants;
- Adhere to general wildlife measures;
- Minimize vegetation removal; and
- Adhering to bird timing windows.

FEI will follow the best management practices and mitigation measures applicable to the Project Upgrades during construction.

7.2.1.5 Aquatic Resources

The 29 Transmission Laterals cross 152 known streams and are located within 100 metres of 164 streams, 5 lakes, 32 wetlands, 8 settling ponds, and 27 non-classified drainages. Associated riparian areas provide habitat for fish and amphibians and management practices specific to aquatic systems will be implemented where the Project interacts with these features.

Best management practices and mitigation measures to minimize and avoid potential negative effects of the Project on aquatic resources are described in Section 6 of the EOA report, including:

- Apply best practices for managing invasive plants;
- Apply measures to avoid causing harm to fish and fish habitat;
- Minimize vegetation removal in riparian areas;

- Adhere to least impact to amphibians and turtles least risk periods; and
- Adhere to least impact to fish timing windows.

7.2.1.6 Species at Risk

The EOA report identifies wildlife and plant species at risk with potential to interact with the Project as well as where the Project may overlap with designated habitat or habitat features. The Project overlaps with Critical Habitat for five species at risk as identified under the Federal Species at Risk Act.

- 5 laterals overlap with Critical Habitat for Caribou - CAS NEL 168, KBY LTL 168, CRK LOP 273, CRK LP2 219, and SSK LTL 219.
- 4 laterals overlap with Critical Habitat for Lewis's Woodpecker (*Melanerpes lewis*) - KA1 LTL & LOP 168, CAS NEL 168, KBY LTL 168, and SSK LTL 219.
- 3 laterals overlap with Critical Habitat for great basin spadefoot (*Spea intermontana*) - KA1 LTL & LOP 168, SAL LOP 168, and COL LOP 168.
- 2 laterals overlap with Critical Habitat for gopher snake (*Pituophis catenifer deserticola*) and Western rattlesnake (*Crotalus oreganus*) - KA1 LTL & LOP 168 and COL LOP 168.

Five provincially blue-listed and 4 provincially red-listed, with one blue listed species also identified as Threatened under the federal Species at Risk Act. One plant community at risk was identified in association with SSK LTL – Antelope-brush / bluebunch wheatgrass (*Purshia tridentata / Pseudoroegneria spicata*).

7.2.2 Permitting

Based on the preliminary environmental assessment work completed by Hemmera, the Project will likely require provincial permitting/authorization under the Environmental Management Act and the Water Sustainability Act, and potentially federal permitting/authorization under the Fisheries Act and the Species at Risk Act. Upon BCUC approval of this Application, FEI will undertake further environmental assessments to confirm permitting requirements and will apply for the required permits accordingly. Expected permitting is listed in Table 7-2. The permits are based on the current level of Project design and may change during the detailed design phase.

Table 7-2: Expected Environmental Permits by Lateral for the Preferred Engineering Options

No.	Lateral Name	Fisheries Act permits	SARA Section 73 permit	BC OGC Waste Discharge permits	BC OGC WSA permits	BC Wildlife Act permits	Municipal permits
1	MAC LTL 168	X		X	X	X	X
2	MAC LOP 168			X	X	X	X

No.	Lateral Name	Fisheries Act permits	SARA Section 73 permit	BC OGC Waste Discharge permits	BC OGC WSA permits	BC Wildlife Act permits	Municipal permits
3	BCF LTL 168			X		X	
5	NWP LTL 168			X		X	
7	PG1 LTL 168			X		X	X
8	PGP LTL 168			X		X	X
9	HUS LTL 168			X		X	
10	PG2 219 168			X		X	
11	CAR LTL 168			X		X	X
12	WIL LP 168			X		X	
13	KA1 LTL 168		X	X		X	X
14	SAL LOP 168	X		X	X	X	X
15	SA3 LTL 168			X		X	X
16	COL LTL 219			X		X	X
17	COL LOP 168	X		X	X	X	X
18	KE1 LOP 219			X	X		
19	CEL LTL 168					X	
20	CAS NEL 168					X	X
21	TRA LTL 168					X	
22	FRD LTL 168/219	X			X	X	X
23	ELK LTL 168					X	
24	CRK LTL 168					X	X
25	CRK LOP 219					X	X
26	CRK LP2 219				X	X	X
27	CRK LOP 273	X			X	X	X
28	KBY LTL 168	X	X		X	X	X
29	SSK LTL 219	X	X		X	X	

7.2.3 Further plans

Environmental constraints and potential environmental impacts related to the Project will be further assessed and documented during the detailed engineering phase of the Project. The detailed design phase will include assessment of vegetation, fish and wildlife and their habitat, and surface/ground water resources.

Site specific mitigation strategies will be developed to offset any potential negative impacts associated with the Project or from the environment on the Project. All required environmental permits and approvals for the Project will be identified and applied for during the detailed engineering phase of the Project.

Detailed environmental specifications will be prepared as part of the Project tendering process to ensure that contractors are aware of the Project's environmental requirements in addition to FEI's internal environmental standards. Environmental Management Plans specific to the Project will be developed by successful contractors prior to commencement of the Project. Environmental monitoring will be undertaken during all sensitive aspects of the work program and the designated environmental monitor will have "stop work authority" in the event that works underway have the potential to impact the natural environment.

7.3 *ARCHAEOLOGY*

FEI retained Stantec, to complete an Archeological Overview Assessment of the Project (Appendix P) to assess the potential for archaeological and/or cultural heritage resources within the Project area and to determine the requirements for AIA prior to ground disturbing activities.

The archaeological overview consisted of desktop review and modeling of the archaeological potential along each lateral, followed by PFR. Field reconnaissance on 22 of the 29 Transmission Laterals complemented the desktop review and provided data on sites with limited existing information. Local resources were used and Indigenous communities were contacted as part of the early outreach process.

7.3.1 Archaeology Overview Assessment

As part of the AOA, Stantec reviewed a range of environmental, archaeological, cultural and historical information. The Project was assessed for archeological potential and overlap with known archaeological sites. PFR surveys were completed based on information from the desktop review and were used to ground-truth higher level archaeological potential modeling results.

The AOA concluded that the majority of the expected Project footprint is considered to have low archaeological potential due to the amount of previous disturbance. AIA has been recommended for ground disturbance activities in areas identified as moderate or high potential through the AOA process. Where the AOA identified potential for deeply buried cultural deposits, construction monitoring will be applied. Potential for deeply buried cultural deposits is present at specific sites along 13 of the laterals.

The report indicated that AIAs will be required for the construction of the Project. Detailed AIAs will be undertaken during detailed design and prior to construction of the Project.

7.3.2 Archaeological Overview Assessment

The results of the work completed by Stantec are outlined in the AOA (Appendix P).

Of the 29 Transmission Laterals, 6 cross previously documented archaeological sites and 4 are within 100 metres of a documented site. Most of the laterals cross variable terrain and mapped areas of moderate to high archaeological potential are scattered along the length of the laterals. One lateral, BCF LTL, has low archaeological potential for its entire length.

Two previously undocumented archaeological sites were identified during PFR, one of which is near the expected footprint of COL LOP LTL, while the second site is not near the expected Project footprint:

- A Jasper biface thinning flake was discovered just outside the boundaries of the proposed COL LOP PFR station footprint; and
- Several cultural depressions were observed along the CAS NEL LTL near the confluence of the Slocan and Kootenay Rivers and within 100 metres of a previously known site.

Permits will be required under the Heritage Conservation Act in order to undertake detailed AIA activities. AIA work will be completed where Project works occur in areas identified as moderate or high archaeological potential. AIA activities are expected to be completed for 22 of the 29 Transmission Laterals. The extent of AIA works will depend on final engineering design.

7.3.3 Indigenous Community Participation

Notifications letters were sent out to Indigenous communities prior to the onset of the AOA preliminary field reconnaissance program. Notification letters outlined the intended fieldwork, included a request for participation in the field program, and opportunities to provide information or comments. Archaeological field crews consisted of one qualified archaeologist and at least one indigenous community member.

The participants from the following communities were involved in the AOA PFR program:

- Lheidli T'enneh Nation
- Lhtako Dené Nation
- Williams Lake Indian Band
- Xatsull First Nation
- Splatsin First Nation
- Okanagan Indian Band
- TMECS
- Shuswap Indian Band

- Ktunaxa Nation Council
- Osoyoos Indian Band

7.3.4 Further Plans

Potential archaeological and cultural impacts associated within the areas of moderate and high archaeological potential will be further assessed during the AIA, which will be undertaken once approval of this Application from the BCUC is obtained and prior to construction. A subsurface testing program will be undertaken, where required, within these areas, as part of the AIA, to further identify sensitive areas. The AIA will provide a detailed assessment to allow for development of site specific mitigation strategies to offset any potential impacts associated with the Project. All archaeological permits will be obtained during the detailed engineering phase of the Project.

Detailed archaeological specifications will be prepared as part of the Project's tendering process to ensure that contractors are aware of the Project's archaeological requirements. As described above, a Project-specific Environmental Management Plan, including protection of archaeological and cultural resources, will be developed by the successful contractors prior to commencement of the Project. If required, archaeological monitoring will be undertaken during all sensitive aspects of the work program and the designated archaeological monitor will have "stop work authority" in the event that works underway have the potential to impact archaeological or cultural resources.

8. CONSULTATION

8.1 *INTRODUCTION*

Public consultation and communication are integral components of FEI's project development process. To guide its public consultation, FEI created a Communications and Consultation Plan that is included as Appendix Q-1 of the Application. The Communication and Consultation Plan outlines potential issues, lists stakeholders, and sets out the general approach to consultation with respect to the work on the 29 Transmission Laterals. FEI has sent out notifications to customers and stakeholders who are potentially directly affected through letters, bill inserts and advertisements. FEI has also held numerous one-on-one meetings with government authorities and responded to requests for further information. FEI has tracked issues or concerns raised and will work with customers and stakeholders to address any outstanding items. FEI will continue to consult with the public as the Project progresses.

FEI has also engaged Indigenous communities and leadership in the area potentially impacted by the Project. FEI engaged early with Indigenous communities that may potentially be affected by the Project to provide information about the Project, describe any potential impacts, understand the interests in the area, and provide an opportunity for Indigenous communities to identify additional impacts and to give input on the Project. Engagement was initiated by notification letters, and then followed by face-to-face meetings as requested. FEI has tracked issues and discussions that took place, with no outstanding concerns raised to date. FEI will continue to notify and engage with Indigenous communities as the Project progresses, particularly through the BC OGC process.

8.2 *PUBLIC CONSULTATION*

8.2.1 Introduction

FEI recognizes that the public expects meaningful consultation and engagement, and its knowledge and interest in energy issues and pipelines is high. FEI's consultation prior to filing the Application consisted of two phases. The first phase of consultation consisted of preliminary information sharing to key stakeholders, in addition to encouraging feedback throughout the process as more details of the Project, such as Project timelines, became available. The second phase of consultation involved sharing a greater level of detail about the Project with affected stakeholders. The communication strategies used were determined by the classification of each of the 29 Transmission Laterals as outlined in Section 8.2.2.4, and were designed to support two-way dialogue, such as through one-on-one meetings.

8.2.2 Communications & Consultation Approach

The focus of the Company's public Communication and Consultation Plan is to ensure that customers, landowners, community stakeholders and other interested and affected parties are

informed about the Project, have access to information regarding the Project, and are encouraged to provide input that may be considered as part of the decision-making process. FEI's main goals for public consultation are: to create a dialogue with interested parties, explain the need for the Project, present FEI's preferred alternatives for the Project, demonstrate the detailed assessment of alternatives, and inform interested parties of the factors that FEI must consider, including environmental impacts, constructability, and rate impacts resulting from the Project.

Issues raised by stakeholders in each community where work is planned, as well as operational requirements with stakeholders (such as municipal permitting for use of roads and ROW, and anticipated impacts to the public and neighborhoods), have been, or will be addressed by FEI. FEI has held and will continue to hold informal and formal meetings with local and regional government, and other impacted stakeholders as part of its public consultation during the Project development phase, and throughout the construction phases of the Project. Activities include:

1. Communication regarding the Project with the pertinent government agencies at the municipal and regional levels;
2. Communication regarding the Project with directly impacted land owners, customers and local residents and businesses;
3. Meetings, presentations and conversations with stakeholders; and
4. Broad-based communications, such as paid media to inform the public where impacts are more substantial, which will occur during the construction phase.

Prior to the start of public consultation for the Project, communication and consultation objectives, impacted stakeholders, and key issues were identified and are described in further detail below.

8.2.2.1 Communication and Consultation Objectives

FEI identified a number of communication and consultation objectives that will drive the public consultation for the Project including:

- Create awareness of the Project, specifically within communities directly impacted by construction by:
  - Ensuring balanced and objective information is provided to all stakeholders regarding the upgrades;
  - Addressing stakeholder concerns or provide explanations when unable to do so;
  - Providing opportunity for public feedback and ongoing dialogue;
- Support Company values of safety, environmental commitment, and customer value; and

- Ensure FEI meets communication and consultation requirements as established by its regulators, which includes:
    - Identifying all issues or concerns raised during consultation and measures that FEI is taking or planning to take to address such issues or concerns. If no action is taken by FEI regarding a specific issue or concern, sufficient reasoning will be provided;
    - FEI's overall evaluation of sufficient public consultation to date; and
    - Future public consultation plans in preparation to application filing.

8.2.2.2 Stakeholders Potentially Affected

As part of its Communication and Consultation Plan, FEI identified key stakeholders. The level of impact to each stakeholder will determine the communication method, extent of engagement and desired level of feedback FEI is seeking. Each of the following stakeholders have been or will be approached to share Project information throughout the different phases of the Project.

1. Residents, businesses, industrial customers and landowners that will be directly impacted by the Project;
2. Provincial government bodies, including: Ministry of Transportation & Infrastructure, Oil & Gas Commission, and Ministry of Forests, Lands, Natural Resource Operations and Rural Development;
3. Municipal and regional governments including: Mayor, Council, City Manager and/or staff within the following municipalities and regions:
    a. Mackenzie;
    b. Prince George;
    c. Quesnel;
    d. Williams Lake;
    e. Kamloops;
    f. Salmon Arm;
    g. Enderby
    h. Armstrong
    i. Spallumcheen
    j. Coldstream;
    k. Kelowna;
    l. Trail;
    m. Castlegar;
    n. Nelson;
    o. Kimberley;

p. Cranbrook;
q. Elkford;
r. Sparwood;
s. Fraser-Fort George Regional District;
t. Cariboo Regional District;
u. Thompson-Nicola Regional District;
v. Columbia-Shuswap Regional District;
w. North Okanagan Regional District;
x. Central Okanagan Regional District;
y. Kootenay-Boundary Regional District;
z. Central Kootenay Regional District; and
aa. East Kootenay Regional District

8.2.2.3 Key Issues, Risks & Impacts Identified

Subject matter experts working on the Project identified a number of key issues and impacts/risks for each of the 29 Transmission Laterals. This analysis was used to help determine the appropriate level of communication and consultation required for each stakeholder group. In broad terms, the key issues and impacts that have and will continue to influence the consultation and communication requirements throughout the duration of the Project include:

- environmental impacts (such as close proximity to bodies of water, tree removals and sensitive habitat);
- public impacts (such as traffic/road disruptions, noise disturbances, and interference to daily operational-use of the land);
- permitting complexity and subsequent approvals;
- customer impacts (such as gas service disruption from construction); and
- the type of land involved in the operational work (such as park, heritage or archaeological sites).

FEI examined these key issues and impacts on each lateral and classified them into three broad tiers (described below in Section 8.2.2.4) which determined the appropriate communication and consultation strategies to be used for each lateral. Overall, the more significant the identified impacts are the higher the degree of consultation and communications activities that will be required to meet the consultation objectives identified in Section 8.2.2.1.

8.2.2.4 Impact Levels

As discussed above, the key issues and impacts on each of the 29 Transmission Laterals were classified into three broad tiers. The communication and consultation strategies will be appropriate to the tier:

- **Tier One – High Impact Potential:** Laterals with the most public, environmental, and customer impacts and permitting requirements will receive the most consultation and engagement focus.
- **Tier Two – Moderate Impact Potential:** Laterals with a lesser degree of public, environmental and customer impacts and permitting requirements will receive a moderate amount of consultation and engagement focus.
- **Tier Three – Low Impact Potential:** Laterals with no or limited public, environmental and customer impacts and permitting requirements will receive a minor amount of consultation and engagement focus.

Table 8-1 below shows the classification for each lateral by tier level:

Table 8-1: Lateral Classification Tiers

Tier One – High Impact Potential	Tier Two – Moderate Impact Potential	Tier Three – Low Impact Potential
PG1 LTL 168 (ILI)	MAC LTL 168 (ILI)	BCF LTL 168 (PLR)
KA1 LTL 168 (PLR)	MAC LOP 168 (ILI)	PG3 LTL 219 (PRS)
KA1 LOP 168 (PLR)	CAR LTL 168 (PLR)	NWP LTL 168 (PRS)
SAL LOP 168 (ILI)	SA3 LTL 168 (PLR)	NWP LOP 219 (PRS)
FRD LTL 219 168 (ILI)	KE1 LOP 219 (PRS)	PG2 219 168 (PRS)
CRK LTL 168 (ILI)		WIL LP1/LP2 168 (PRS)
CRK LOP 219 (ILI)		COL LTL 219 (PRS)
CRK LP2 219 (ILI)		COL LOP 168 (PRS)
CRK LOP 273(ILI)		TRA LTL 168 (PRS)
KBY LTL 168 (ILI)		CEL LTL 168 (PRS)
SSK LTL 219 (ILI)		CAS NEL 168 (PRS)
		PGP LTL 168 (PRS)
		HUS LTL 168 (PRS)
		ELK LTL 168 (PRS)

8.2.2.5 Consultation Strategies by Tier

Using the tier classification described above, FEI identified a number of consultation and communication strategies for each lateral during the various phases of the Project, as appropriate:

- Tier One Strategies:
  - Industrial customer engagement (i.e. letters (Appendix Q-2), meetings, emails, phone calls);
  - Notification letter to directly impacted land owners (Appendix Q-3);
  - Community information sessions and/or presentations (Appendix Q-4); and
  - Local and/or regional government stakeholder meetings (Table 8-2).
- Tier Two Strategies:
  - Industrial customer engagement (i.e. letters (Appendix Q-2), meetings, emails, phone calls);
  - Notification letter to directly impacted landowners (Appendix Q-3): and
  - Local and/or regional government stakeholder meetings (Table 8-2).
- Tier Three Strategies:
  - Industrial customer engagement (i.e. letters (Appendix Q-2), meetings, emails, phone calls);
  - Notification letter to directly impacted landowners (Appendix Q-3); and
  - Local and/or regional government stakeholder meetings, only upon request (Table 8-2).

Each of the strategies listed above allow opportunity for stakeholders to provide FEI with feedback, and will be an iterative and ongoing process.

8.2.2.6 Communication Materials to Support Consultation

To support the consultation activities outlined in the previous section, FEI developed Project communication materials that will be used and updated as required throughout the duration of the Project:

- A Project webpage on FEI's Talking Energy website platform. The webpage provides a high level overview of the Project, including detailed maps of where the 29 Transmission Laterals are located. The URL is talkingenergy.com/inlandgasupgrades (Appendix Q-5). The webpage went live on June 15, 2018.

- A list of key messages to help describe the Project in relatable terms. The messages include: the type of work that will be involved, where the work will take place and the proposed timing of the Project (Appendix Q-6).
- A Project email address (inlandgasupgrades@fortisbc.com) and direct phone line to help better direct inquiries FEI receives about the Project. Both of the channels went live in June 2018 and will continue to be closely monitored throughout the Project.
- Paid advertisements, including digital advertising distributed Province wide and paid advertisements in local newspapers of impacted communities, published in August and September 2018. (Appendix Q-7).
- A bill insert (Appendix Q-8) was mailed to all customers in September 2018 to provide information about the Project. In the same month, e-billing customers received a link to a soft copy along with their emailed bill. An ad was also placed alongside the e-billing portal that over 360 thousand customers potentially saw when they paid their bills online (Appendix Q-9).

8.2.3 Community, Social and Environmental Considerations

An overview of the community, social and environmental setting in which each of the 29 Transmission Laterals will be constructed and operated is included in Section 4.6 of the Application. The Project takes place in a largely rural landscape with low population density in the residential areas. Community, social and environmental considerations were taken into account in the alternative analysis (described in Section 4), and have helped guide the consultation and communication plans. As the Project nears the construction phase, each lateral's unique characteristics and impact potential will influence the consultation and communication strategies used, and community, social and environmental factors will continuously inform FEI's approach.

8.2.4 Description of Consultation to Date & Plans to Address Concerns

FEI engaged with a number of stakeholders that were identified at the outset of the Project, as described in Section 8.2.2.2. The following sections provide a summary of these activities including any issues and/or concerns that were raised throughout the process, as well as plans for addressing these concerns during the Project execution. FEI will continue to track all consultation (and corresponding feedback) as the Project progresses.

8.2.4.1 Public and Residential Customer Consultation to Date

FEI has engaged with the public, customers and affected landowners through three different communication methods to provide information about the Project, contact information and allow the public to provide feedback. These methods included:

- Notification Letters:
  - Notification letters were mailed to directly impacted landowners on June 15, 2018. A sample of the letter can be found in Appendix Q-3. The letters provided information about the Project, the regulatory process and how to contact FEI with any questions or concerns.
  - FEI received five responses from the notification letter mailing: one from B&A Planning Group, a land use-planning consultant for TransCanada Corporation; one from Canadian National Railway Company; one from BC Hydro and Power Authority; and two from residential FEI customers inquiring about the potential rate impact. The responses are discussed in more detail in Sections 8.2.4 and 8.2.5 below.
- Bill Inserts:
  - Natural gas customers received bill inserts in the September 2018 billing cycle providing information about the Project, as described previously in Section 8.2.2.6.
- Paid Advertisements:
  - FEI communicated information about the Project through various paid media advertisements including: digital media ads distributed province wide, and paid newspaper ads in local newspapers of communities most affected by the Project. Examples of these ads can be found in Appendix Q-7.

FEI had planned a public information session at Kenna Cartwright Park on August 28, 2018 in Kamloops. This session was planned due to the expected impact of the work to be completed at the park, and was supported by the municipality. After consideration, however, it was later determined by the municipality that the open house would be premature and should be rescheduled when Project plans, such as construction timelines and impacts have been finalized, in order to meaningfully engage with the public. FEI will work with the City of Kamloops to reschedule this session.

FEI also engaged with the Shuswap National Golf Course, formally the Canoe Creek Golf Course, on July 25, 2018 to discuss the Project details and impacts. The general manager advised FEI that the golf course is awaiting budget approvals to build a new course entrance on a road, which runs parallel to the Project's projected construction route for the Salmon Arm Lateral (SA3 LTL 168), a 0.8 kilometre pipeline requiring replacement. The Shuswap National Golf Course management team is interested in completing construction of the new entrance and FEI pipeline replacement in the same timeframe. FEI is committed to keeping the management group at the golf course engaged with Project details and timelines as construction nears.

FEI also provided advanced notification to landowners along FEI's rights of way, informing them about upcoming preliminary Project environmental and survey work. The landowners were notified by phone call or letter, and no concerns were raised. FEI will continue to provide advanced notification of work throughout the duration of the Project.

FEI believes the communication methods selected and executed were effective, and provided FEI natural gas customers the opportunity to adequately respond and provide input into the Project.

8.2.4.2 Industrial Customer Consultation to Date

FEI identified the industrial natural gas customers that could potentially be impacted by the Project during construction. These impacts include minor traffic delays on construction routes and the potential for restricted access to peak demand gas use (when the customer uses the most gas to run their operations), most of which is historically not utilized by industrial customers. As natural gas is an integral component of an industrial customer's daily operations, FEI understands the importance of engaging with all impacted industrial customers, discussing the Project's details and seeking to mitigate any impacts where applicable. Some of the consultation methods are outlined below in more detail.

- Notification Letter:
  - Notification letters were mailed to industrial customers on July 20, 2018. A sample of the letter can be found in Appendix Q-2. The letters provided potentially impacted industrial customers with information about the Project, the lateral locations where they have land along FEI right of way, the regulatory process and how to contact FEI with any questions or concerns.
- Phone Calls:
  - Phone calls to industrial customers serviced by the 29 laterals were made by FEI. The purpose of the calls were to inform the customers of the upcoming application submission, the type of work that would be taking place on each of the respective laterals, the possibility of temporary service disruptions during construction of the Project, and FEI's commitment to minimizing these disruptions as much as possible.
- Future Consultation:
  - Follow up discussions will take place with industrial customers, as more information is available to discuss construction timelines, right of way requirements, property access and potential impacts to operations.

8.2.4.3 Local Government Consultation to Date

Table 8-2 below provides a summarized log of the meetings, presentations and correspondence FEI has completed with key local government stakeholders. From these presentations and discussions, follow up meetings and communications took place, where more detailed information was shared and discussed, and issues and/or concerns were addressed. Tables below have been organized alphabetically by municipality/region, and then chronologically within the city.

Table 8-2: Summary of Local Government Consultation

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
Regional District of Central Kootenay, Area E (Blewett)	**Communication Type:** Inbound email **Location:** n/a **Date**: April 25, 2018 **Email received from:** Ramona Faust, Director Area E, Regional District of Central Kootenay **Stakeholder Interests:** There is an interest in exploring natural gas services for residents of Blewett.	**Follow-up:** FEI replied in person to Director Faust that FEI will investigate if providing gas to the residents of Blewett during Project construction will be feasible.
City of Cranbrook	**Communication Type:** In-person Meeting **Location:** 40 10 Avenue S, Cranbrook, BC **Date**: June 13, 2018 **In Attendance from Cranbrook:** Rob Veg, Senior Planner Rob Price, Planner Tony Hetu, Deputy Director of Public Works Mike Matejka, Manager, Infrastructure Planning Chris Mummery, Construction Compliance Tech. **In Attendance from FEI:** David Seaby, Operations Manager Blair Weston, Community & Indigenous Relations Manager **Stakeholder Interests:** The city requested detailed information on all proposed dig sites, one year prior to the start of construction.	**Next Steps:** Follow-up communications will be ongoing with the City of Cranbrook closer to Project construction dates.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
District of Elkford	**Communication Type:** In-Person Meeting **Location:** 760 Copper Road, Invermere BC **Date**: April 27, 2018 **In Attendance from Invermere:** Curtis Helgesen, Chief Administrative Officer for the District of Elkford. **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** Mr. Helgesen requested detailed map of the proposed construction route for Elkview Lateral 168 (ELK LTL 168).	**Next Steps:** Follow-up meeting was scheduled and held on June 5, 2018 to review route maps and provide more Project details (see entry below).
	Communication Type: In-Person Meeting **Location:** 816A Michel Road, Elkford, BC **Date**: June 5, 2018 **In Attendance from Elkford:** Curtis Helgesen, Chief Administrative Officer for the District of Elkford. **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** Mr. Helgesen inquired about the ability to tie a new gas main extension to a new subdivision during FEI's Project construction in the area.	**Next Steps:** FEI will follow-up with the District when the Project is approximately a year away from construction about the potential main extension.
Association of Kootenay Boundary Local	**Communication Type:** Presentation **Location:** 901 6 Avenue, Fernie, BC **Date**: April 19, 2018	**Next Steps:** One-on-one meetings were held (detailed in next section

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
Governments Conference	**In Attendance:** Association of Kootenay Boundary Local Governments Conference, 200 representatives in attendance, including local government elected officials and staff. **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager Darin Wong, Community and Indigenous Relations Manager **Stakeholder Interests:** No concerns or interests were raised.	of table) on April 19, 2018 with municipalities with highest potential impacts.
	Communication Type: Follow-up, in-person Meeting **Location:** 901 6 Avenue, Fernie, BC **Date**: April 19, 2018 **In Attendance from Fernie:** Rob Gay, Director Area A, Regional District East Kootenay Mike Sosnowski, Director Area C, Regional District East Kootenay Andy Davidoff, Director Area I, Regional District East Kootenay **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** Attendees requested detailed maps of pipeline routes, inquired about rate impacts, and local procurement opportunities.	**Next Steps:** A follow-up meeting will be scheduled to address stakeholder interests as Project information becomes available. No date set at this time.
	Communication Type: Follow-up, in-person Meeting **Location:** Whistler, BC **Date**: September 12, 2018	FEI provided Mr. Horn with an update on the Project, while attending the UBCM conference. No concerns were

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
	In Attendance from Regional District Kootenay Boundary: Stewart Horn, Chief Administrative Officer **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Note:** Mr. Horn attended FEI's presentation held at the Association of Kootenay Boundary Local Governments Conference on April 19, 2018.	raised and no additional follow up is required at this time.
Regional District of Kootenay Boundary	**Communication Type:** Follow-up, in-person Meeting **Location:** Whistler, BC **Date**: September 11, 2018 **In Attendance from Regional District Kootenay Boundary:** Mark Andison Chief Administrative Officer **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Note:** Mr. Andison attended FEI's presentation held at the Association of Kootenay Boundary Local Governments Conference on April 19, 2018.	FEI provided Mr. Andison with an update on the Project, while attending the UBCM conference. No concerns were raised and no additional follow up is required.
Regional District of Central Kootenay	**Communication Type:** Inbound email. **Location:** n/a **Date**: May 31, 2018 **Email received from:** Andy Davidoff, Director Area I, Regional District of Central Kootenay	**Next Steps:** Digital copies were provided in confidence. No additional follow up is required at this time.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
	Stakeholder Interests: FEI received an email requesting the maps of proposed dig sites for the Project on the Castlegar Nelson Lateral (CAS NEL LTL 168).	
	Communication Type: Inbound email **Location:** n/a **Date**: May 31st, 2018 **Email received from**: Andy Davidoff, Director Area I, Regional District of Kootenay **Stakeholder Interests:** Director Davidoff's email inquired if FEI planned any public information sessions in the Regional District of Kootenay and if FEI is aware of the private water line crossings that cross FEI's right of way in the area. Asked to ensure FEI contacts water license holders, which have water pipes crossing FEI rights of way prior to construction.	**Follow-Up** FEI informed Director Davidoff about FEI's notification letters that were sent to affected landowners. Discussed with Director Davidoff that FEI was going to wait to see if there were any responses to the notification letters before deciding on the need for an open house. FEI also informed Director Davidoff of the BC OGC process and the need for more consultation closer to start of Project construction. FEI suggested that this was a better time for an open house for the residents and Director Davidoff agreed. No further follow up is required at this time.
	Communication Type: outbound phone call **Location:** n/a **Date**: August 14, 2018 **Phone call to**: Andy Davidoff, Director Area I, Regional District of Kootenay	Provided Director Davidoff with an update on the Project.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
City of Kamloops	**Communication Type**: In Person Meeting **Location**: 7 Victoria Street W, Kamloops, BC **Date:** May 30, 2018 **In Attendance from Kamloops:** Jen Fretz, Public Works and Utilities Director Wendy Heshka, Communications Manager Jeff Putnam, Parks and Civic Facilities Manager Kirsten Wourms, Crew Leader - Natural Resources Michael Doll, Parks Ops & Planning Supervisor **In attendance from FEI:** Tony Pham, Project Manager Matt Mason, Community and Indigenous Relations Manager **Stakeholder Interests:** The scope of the Project was discussed. The City does not have any objections to the Project, but the City's primary interests and concerns are related to the Kenna Cartwright Park. The Kenna Cartwright Park ground has recently gone through a BC Hydro power line upgrade project, and construction for the Trans Mountain pipeline project is scheduled roughly around the same time as the Project (estimated in 2020). The City wants FEI to inform and engage with the public regarding impacts to the park. The City has requested that FEI hold public information sessions. The City would like to be involved in the restoration plan once Project construction is complete. The City is interested in Project legacy commitments, such as park benches and a gazebo.	**Next Steps**: FEI will send details on restoration plan, Project schedule, public information session planning and communication planning to stakeholders.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
	Communication Type: Follow-Up, In-Person Meeting **Location:** 7 Victoria Street W, Kamloops, BC **Date:** June 27, 2018 **In Attendance from Kamloops:** Jen Fretz, Public Works and Utilities Director Wendy Heshka, Communications Manager Jeff Putnam, Parks & Civic Facilities Manager Kirsten Wourms, Crew Leader, Natural Resources Michael Doll, Parks Operations & Planning Sup. **In Attendance from FEI:** Matt Mason, Community and Indigenous Relations Manager **Stakeholder Interests:** Discussed location for public information session (*determined to host at the park entrance*) and which community groups to involve. Discussed City involvement with restoration planning, ROW width increase requirements, mayor and council communication, and City leadership (Directors) presentation.	**Follow-Up:** FEI will schedule a follow-up meeting to discuss venues for the information session and council presentation format.
	Communication Type: Follow-Up, In-Person Meeting **Location:** 7 Victoria Street W, Kamloops, BC **Date**: July 9, 2018 **In Attendance from Kamloops:** Ken Christian, Mayor of Kamloops Marvin Kwiatkowski, Director of Development and Engineering Services Wendy Heshka, Communications Manager	**Follow-Up:** Follow-up requirements include: ongoing Project updates to City Council and staff as the Project progresses.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
	In Attendance from FEI: Kevin Gerow, Regional Manager, Interior North Matt Mason, Community and Indigenous Relations Manager **Stakeholder Interests:** The City requested an in-camera meeting held in August to discuss the additional ROW widening needed. This will require City Council approval for additional land requirement. FEI briefly spoke about the public information session scheduled for August 28, 2018. This was to confirm if there were any outstanding concerns or requests from the City. No concerns were raised from the City about the public information session at this time.	
	Communication Type: Follow-Up, Phone Call **Location:** N/A **Date**: July 25, 2018 **In Attendance from Kamloops:** Jen Fretz, Public Works and Utilities Director Wendy Heshka, Communications Manager Jeff Putnam, Parks and Civic Facilities Manager Kirsten Wourms, Crew Leader - Natural Resources Michael Doll, Parks Ops & Planning Supervisor **In Attendance from FEI:** Matt Mason, Community and Indigenous Relations Manager **Stakeholder Interests:** City staff expressed reservations regarding the timing of the public information session scheduled for August 28, 2018. The City felt strongly that the information session was premature, and that it would be would be more beneficial to postpone the public information session until more detailed Project information was available to share with the public.	**Follow-Up:** FEI has postponed the planned public information session, and is seeking to reschedule the session for some time in the Fall 2018. FEI will continue to engage and communicate with City staff regarding Project details as they become available.

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
City of Kimberley	**Communication Type:** In-person Meeting **Location:** 340 Spokane Street, Kimberley, BC **Date**: June 6, 2018 **In Attendance from Kimberley:** Scott Summerville, Chief Administrative Office, City of Kimberley **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** The District would like to ensure that when/if the Project impacts the *Rails to Trails* natural trail between Cranbrook and Kimberley, that ample notification to the public is given, and there is always an accessible path around the worksite.	**Next Steps:** Before the Project begins, FEI will review impacts to the *Rail to Trail* nature trail and discuss plans to mitigate impacts with the District of Kimberley.
Rocky Mountain and Kootenay Local Government Association.	**Communication Type:** Presentation **Location:** 760 Copper Road, Invermere, BC **Date**: April 27, 2018 **In Attendance:** 150 representatives from local area governments were in attendance. **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** A high-level presentation of the Project was provided to attendees. No issues or concerns were raised.	**Next Steps:** Follow-up one-on-one meetings were held on April 27, 2018 with municipalities with highest impacts (detailed in other sections of the table).

Local Government	Discussion Summary and/or Issues Raised	Next Steps / Follow up
Southern Interior Local Governments Conference	**Communication Type:** Presentation **Location:** 600 Campbell Avenue, Revelstoke, BC **Date**: April 25, 2018 **In Attendance:** 150 representatives were in attendance. **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** Attendees asked general Project questions about timelines and routes. Requested more information as the Project moves forward.	**Next Steps:** Follow-up meetings will be scheduled once the Project has been approved and construction schedules are finalized.
District of Sparwood	**Communication Type:** In-person Meeting **Location:** 136 Spruce Avenue, Sparwood, BC **Date**: June 5, 2018 **In Attendance from Sparwood:** Terry Mercer, Chief Administrative Office, District of Sparwood **In Attendance from FEI:** Blair Weston, Community and Indigenous Relations Manager **Stakeholder Interests:** The District requested Archeological and Environmental reports that were completed in the District. The District has requested shape files of the Project for their respective region.	**Next Steps:** FEI provided maps of the Project and will send shape files of the Project a year before the construction date. FEI will also follow up with the environmental and archeological reports once they are complete.

8.2.5 Issues and Concerns Raised

FEI identified, engaged, and solicited feedback from the public and affected parties and provided them with updated information on Project details, pipeline routes and preferred construction methods for each lateral.

To date, FEI has received three concerns expressed about the Project (described below). The low number of concerns expressed is likely due to the overall rural landscape of the Project's intended construction work, low resident and business density on pipeline routes, and the preferred alternatives selected for each lateral.

During FEI's initial consultation with the City of Kamloops had raised concerns about the pipeline replacement for KA1 LTL 168 that traverses Kenna Cartwright Park, a regularly used Municipal park in Kamloops. Requests by the City of Kamloops include:

- **Public Consultation:** The City of Kamloops has requested public engagement and awareness about the Project.
  - FEI is committed to transparent public consultation.
  - In addition to notification letters, stakeholder meetings and paid advertisements, FEI proposed an open house session for Kamloops residents prior to submission of the CPCN Application. Through engagement with the municipality, the City of Kamloops determined that it would be more effective to hold a public consultation session once more detailed information about the construction plans and schedule were known. FEI committed to follow up with the City of Kamloops to collaborate on rescheduling the session.
- **Legacies:** The City of Kamloops requests proper restoration efforts with the addition of park benches and a gazebo. The City of Kamloops also wishes to be actively involved during the restoration phase.
  - FEI's objective is to create these legacies as a part of the restoration commitment, and maintain open communication with the City of Kamloops during the restoration phase.

The City of Kimberley also expressed concern regarding the North Star Rails to Trails corridor, a 25-kilometre nature trail that connects the City of Kimberley to the City of Cranbrook. The City requested that the trail remain open during construction. FEI is aware of the concern, and will continue to work with the City of Kimberley through future meetings closer to the construction period.

FEI received five emails in response to the notification letters. Three of these emails were from B&A Planning Group, a land use-planning consultant for TransCanada Corporation, Canadian National Railway Company, and BC Hydro and Power Authority. In summary, all three stakeholders have acknowledged the Project, and wish to maintain open and active communication during construction to ensure any third party assets and/or business operations

are unaffected. The fourth and fifth email were from residential customers. The residential customer email inquired about potential rate impacts as a result of the Project, to which FEI replied with the requested information.

It is FEI's objective to maintain open communication with all parties prior to, during and after the construction phase of the Project.

8.2.6 Outstanding Issues or Concerns

As outlined in Section 8.2.4, the comments received from the City of Kamloops about requests for restoration within the park (including the incorporation of benches and a gazebo), and the City of Kimberley's concern expressed over the Rails to Trails corridor are the only outstanding issues raised with regard to the Project. FEI has responded to the request for restoration raised by the City of Kamloops, and will continue open communication prior to, during and after construction is completed with the City of Kamloops, B&A Planning Group and Canadian National Railway Company. FEI will also maintain ongoing communication and collaboration with the City of Kimberley to minimize impacts to the trail.

8.2.7 Consultation and Communications Plan Going Forward

FEI is committed to continuing consultation with Project stakeholders, including keeping stakeholders updated and providing ways to offer feedback or request information, as the Project progresses. FEI will comply with all BC OGC permitting requirements, where applicable, which includes further Project notifications to key stakeholders prior to construction.

As the Project progresses, FEI will continue to consult and communicate about the Project to keep customers, residents, landowners, local government staff and other interested parties informed about the Project. Communication and consultation methods could include:

- Emails to stakeholders who have signed up to receive Project updates (web portal will permit connections as the Projects proceed);
- Project updates posted on FEI's Talking Energy website;
- Letter drop offs/notifications as required;
- Articles and stories in the media – both proactive and reactive;
- Meetings on request; and
- Presentations on request.

Due to the broad geographic scope of this Project, and the diverse nature of the upgrades proposed (i.e., ILI, PLR or PRS), FEI's Communication and Consultation Plan will be tailored to best meet the communications requirements of each impacted community and stakeholder. For example, a very rural area may be better served by letter drop offs, whereas an urban centre may be better served by digital ads, newspaper ads, etc. The construction schedule (found in

Section 5.6) will be critical in determining the timing and frequency of consultation and communication efforts, with the majority of information sharing about the Project taking place closer to construction.

8.2.8 Overview of Sufficiency of Public Consultation Process to Date

FEI believes that the communication plan and the public consultation activities to the time of filing the Application have been sufficient, appropriate and reasonable to meet the requirements of the CPCN Guidelines. FEI will continue to consult with stakeholders regarding construction timelines, construction spaces, plans on mitigating traffic disruptions (where applicable) and public safety. Further consultation will continue prior to and throughout construction to help inform local government and residences about construction activities in their area in an effort to minimize impacts.

FEI is dedicated to maintaining open dialogue and good relationships with businesses, landowners and local government throughout the various stages of construction and will work with them to minimize the impacts of the Project.

8.3 *ENGAGEMENT WITH INDIGENOUS COMMUNITIES*

FEI is committed to building good working relationships with Indigenous communities guided by the FEI Statement of Indigenous Principles[45]. Although the duty to consult rests with the Crown, FEI may be delegated responsibility for certain aspects of the process by the Crown, including by the BC OGC. These aspects include engagement with identified Indigenous communities in a thorough, timely, and meaningful way.

In this section, FEI outlines the Company's approach to identification and early engagement of potentially impacted Indigenous communities, and details the Company's Indigenous engagement plan going forward.

8.3.1 Engagement Approach

FEI has been engaging early with Indigenous communities that may potentially be affected by the Project to:

- Provide information about the Project;
- Describe any potential impacts from the Project;
- Understand the interests of Indigenous communities in the area and how they may be affected by the proposed work; and
- Provide opportunities to give input on the Project.

[45] "Statement of Principles" https://www.fortisbc.com/About/OurCommitments/IndigenousRelations/Pages/Statement-of-Principles.aspx

Engagement was initiated by notification letters followed by face-to-face meetings as requested by the respective community. FEI community relations managers based throughout the Province led engagement with Indigenous communities located in their respective areas.

One purpose of FEI's early engagement is to better understand the nature of interests of Indigenous communities in the area of each of the 29 Transmission Laterals. The impacts of the Project vary by site depending on the proposed work on each lateral. For instance, pressure regulating stations should have negligible impacts to the area; however, pressure regulating stations may require the procurement of additional land to accommodate the new permanent footprint and in some cases temporary workspace. For laterals that require ground-disturbing work, impacts may include disturbance to areas of archaeological potential, riparian areas, and critical habitat for species at risk. In some instances, Project work will occur in proximity to traditional use areas and/or spiritual sites. Based on these factors, there are a number of types of work that could have a potential impact on Aboriginal rights and title. As such, it is important to open dialogue with Indigenous communities and receive their input on potential impacts.

A challenge with early stage project engagement is the level of detail available. Most communities that met with FEI were interested in Project details that were not available at the time of initial engagement. Indigenous communities were informed of this limitation. Any requests that were not addressed were logged and follow up meetings will be scheduled as additional information becomes available.

8.3.2 Indigenous Communities Potentially Affected

Due to the geographic extent of the Project, a number of Indigenous community territories will be potentially affected by the Project. A list of potentially affected communities was developed using the Province of British Columbia's Consultative Areas Database (CAD, found in Appendix R-1). The database was queried using Project shape files to create a comprehensive list of Indigenous communities whose traditional territory is located along the route. This list is organized by lateral in Table 8-3 below.

Table 8-3: Indigenous Community by Lateral

Lateral	Indigenous Community
Castlegar	Adam Lake
	Neskonlith Indian Band
CEL LTL 168	Penticton Indian Band
CAS NEL 168	Upper Nicola Indian Band
	Okanagan Nation Alliance
	Lower Similkameen Indian Band
	Okanagan Indian Band
	Splats'in First Nation
	Osoyoos Indian Band
	Shuswap Indian Band

Lateral	Indigenous Community
Coldstream – Kelowna COL LTL 219 COL LOP 168	Neskonlith Indian Band Penticton Indian Band Upper Nicola Indian Band Okanagan Nation Alliance Okanagan Indian Band Lower Similkameen Indian Band Splats'in First Nation
Kelowna KE1 LOP 219	Westbank First Nation Esh-kn-am Cultural Resources Management Services Nooaitch Indian Band Okanagan Nation Alliance Penticton Indian Band Upper Nicola Indian Band Lower Similkameen Indian Band Okanagan Indian Band
Cranbrook – Kimberly – Skookumchuck CRK LTL 168 CRK LOP 219 CRK LP2 219 CRK LOP 273 KBY LTL 168 SSK LTL 219	Shuswap Indian Band Ktunaxa Nation Council*
Elkford – Sparwood FRD LTL 219 168 ELK LTL 168	Shuswap Indian Band Ktunaxa Nation Council*
Kamloops KA1 LTL 168 KA1 LOP 168	Adams Lake Indian Band Ashcroft Indian Band Little Shuswap Lake Indian Band Bonaparte Indian Band Whispering Pines/ Clinton Band Neskonlith Indian Band Nooaitch Indian Band Esh-kn-am Cultural Resources Boothroyd Indian Band Spuzzum First Nation Skuppah Indian Band Nlaka'pamux Nation Tribal Council Nicola Tribal Association Lower Nicola Indian Band

Lateral	Indigenous Community
	Lytton First Nation Siska Indian Band Cook's Ferry Indian Band Coldwater Indian Band Oregon Jack Creek Indian Band Skeetchestn Indian Band Tk'emlups Band Stk'emlupsemc te Secwepemc Nation (SSN)
Mackenzie MAC LTL 168 MAC LOP 168 BCF LTL 168	Blueberry River First Nation West Moberly First Nation Halfway River First Nation Doig River First Nation MacLeod Lake Indian Band
Prince George PG2 219 168 PG3 LTL 219 PG1 LTL 168 NWP LTL 168 NWP LOP 219 PGP LTL 168 HUS LTL 168	Nak'azdli Whut'en' Nazko First Nation Carrier Chilcotin Tribal council Lheidli – T'enneh Band
Quesnel CAR LTL 168	Tsihlqot'in National Government Carrier Chilcotin Tribal Council Lhtako Dene Nation Lhoosk'uz Dene Nation Ulkatcho First Nation
Trail TRA LTL 168	Neskonlith Indian Band Penticton Indian Band Upper Nicola Indian Band Okanagan Nation Alliance Lower Similkameen Indian Band Okanagan Indian Band Splats'in First Nation Osoyoos Indian Band Shuswap Indian Band Ktunaxa Nation Council*
Salmon Arm SAL LTL SAL LOP	Neskonlith Indian Band Okanagan Nation Alliance Penticton Indian Band Upper Nicola Indian Band Lower Similkameen Indian Band

Lateral	Indigenous Community
	Okanagan Indian Band Adams Lake Indian Band Little Shuswap Lake Indian Band Splats'in First Nation
Williams Lake WIL LP1/LP2 168	Xats'ull First Nation Northern Secwepemc Tribal Council Canim Lake Band Neskonlith Indian Band Tsihlqot'in National Government Williams Lake Indian Band

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

8.3.3 Description of Consultation to Date

Notification letters included as Appendix R-2 were sent to all Indigenous communities along the Project routes on May 8, 2018, that provided them with a high-level overview of the Project and a way to contact FEI with questions they may have.

Following the notification letters, Community and Indigenous Relations Managers attended in-person meetings as requested by communities. From these preliminary discussions, FEI gained understanding of the level of interest of the community in the Project and, if applicable, defined a process through which the community would like to be engaged as the Project progresses.

8.3.4 Issues and Concerns Raised

Following the initial notification letter, FEI received requests for more detailed Project information from a number of communities. FEI has responded to these requests by providing Project shape files where available. For information that is not yet available, such as detailed construction timeframes, FEI has committed to follow up with the community once these details have been determined. Table 8-4 below provides a summary of FEI's consultation with Indigenous communities to date.

Table 8-4: Summary of Consultation with Indigenous Communities

Indigenous Community	Summary of Discussion and/or Issues Raised	Next Steps / Follow up
Splats'in First Nation	In person meeting May 2, 2018 with Director, Title & Rights to discuss Inland Gas Upgrades Project and lateral locations within Splats'in area of interest. Director confirmed they would like to be kept informed about work on SAL LTL and SAL LOP as there is potential for impact to known traditional land use areas and unrecorded archaeological areas; also discussed potential for procurement through Splats'in development corporation business Yucwmenlúcwu, a cultural and natural resource management company.	FEI will continue to provide updates as the Project moves forward, construction timelines are confirmed and procurement opportunities are identified. FEI will continue to meet with the Splats'in First Nation as needed.
	Follow up meeting held on July 17, 2018 with Yucwmenlúcwu of Splats'in Indian Band. Discussed Project scope, areas of interest to the community and procurement/training opportunities.	FEI will continue to meet with Yucwmenlucwu to provide updates on construction timelines and procurement opportunities.
Westbank First Nation	FEI had an in-person meeting on May 31, 2018 with Westbank First Nation Intergovernmental Affairs, Rights & Title and Referrals Coordinator regarding KEL 1 LOP. FEI advised that proposed work is for pressure regulating stations and additional land around the existing station will be required.	FEI to follow up with Westbank First Nation Archaeology to discuss any concerns regarding land requirements.
Stk'emlupsemc te Secwepemc Nation (SSN)	FEI received an email request on May 10, 2018 from Referral Manager for additional maps. FEI requested an in-person meeting to share more information. The meeting was rescheduled twice by Referrals Manager.	FEI spoke with the Director of Operations (Otis Jasper) in an informal meeting about the Project and he did not seem concerned due to the construction being 3 years out. Detailed meeting on the Project will be called in the future and maps will be shared at that time.
Bonaparte Indian Band	On June 4, 2018, FEI received an email response to notification letter from the Director of Natural Resources, requesting clarification regarding the area of the proposed pipeline.	FEI responded that the proposed work is in the area of Kamloops, outside the area of interest for Bonaparte Indian Band.
Southern Dakelh Nation Alliance	On May 8, 2018, FEI received an email response to the notification letter from the Land and Resource Officer directing FEI to engage with alliance member bands directly.	

Indigenous Community	Summary of Discussion and/or Issues Raised	Next Steps / Follow up
Lheidli T'enneh	On May 9, 2018, FEI received a response to the notification letter regarding the consultation process the band prefers.	FEI followed up with Referrals Officer to determine what other information is required and sent the requested information to the Referrals Officer. FEI is committed to meeting with the Lheidli T'enneh again once more information on the Project is available to share.
	On November 22, 2018, FEI met with Chief Dominique and Band Manager Joe.	FEI provided them with an update on the Project, no concerns raised and no additional follow up is required at this time.
Ktunaxa Nation Council	FEI had an in-person meeting at the Ktunaxa Nation Council Office on June 8, 2018. Five representatives of the Lands Sector of the Ktunaxa Nation attended. A follow up meeting was held at the Ktunaxa Nation Council Office on June 28th with the Economic Sector of the Ktunaxa Nation. Attendees discussed ways in which the Ktunaxa Nation and community-owned businesses could participate in the Project. FEI assured the Ktunaxa Nation that there would be ongoing engagement on economic opportunities.	The Ktunaxa Nation has provided FEI a letter (Appendix R-3) outlining details they would like to see included in the Environmental and Archaeological plan for the Project. The letter also outlines their position on how to engage, and provide economic and employment opportunities during the length of the Project.
	FEI had an in-person meeting at the Ktunaxa Nation Council Office on August 29, 2018. Two representatives of the Economic Development attended. FEI provided them with an update on the Project.	FEI will continue to keep the Ktunaxa Nation Council informed as the Project progresses.
Neskonlith Indian Band	FEI had an in-person meeting with the Tmicw Department on June 19, 2018 to discuss the Project. The Neskonlith Indian Band Chief joined the discussion by phone. Tmicw requested more detailed information regarding each lateral, and expressed interest in procurement opportunities during the archaeological work and construction.	FEI sent shape files for each lateral location and additional detailed Project information on June 26, 2018.
	Follow up meeting with Executive Director was held on July 23, 2018. The discussion focused on potential procurement and training opportunities	FEI will have ongoing meetings as the Project progresses to keep community up to date on developments.

Indigenous Community	Summary of Discussion and/or Issues Raised	Next Steps / Follow up
Osoyoos Indian Band	FEI had an in-person meeting on July 4, 2018 with Referrals Coordinator to discuss the Project. Request to see the environmental plan once complete and review dig locations for culturally sensitive areas, not just archeological sites	FEI provided digital shape files for the laterals in Osoyoos Indian Band traditional territory, and copy of the archeological and environmental assessments currently underway.
Coldwater, Cook's Ferry and Siska Band	FEI received an email on July 6, 2018 acknowledging receipt of notification letter from FEI.	FEI responded and offered to meet and discuss the Project.
Okanagan Indian Band	FEI received confirmation of receipt of notification letter on May 9, 2018.	FEI responded and offered to set up a meeting to review the Project in more detail.

8.3.5 Outstanding Issues or Concerns

A number of Indigenous communities expressed interest in working on the Project in some capacity. Follow up meetings will be scheduled with these communities as additional information around contracting and procurement becomes available.

Some concerns such as those related to sensitive areas require additional, site specific information that is not available at this early Project stage. FEI will continue to engage with those communities that have requested additional information with follow up meetings as the Project design becomes more certain.

8.3.6 Documentation and Evidence Supporting Consultation Efforts

All correspondence associated with the consultation that took place with the identified Indigenous communities in connection with the Project is included in Appendix R-4.

8.3.7 Overview of Sufficiency of Consultation Process to Date

FEI engaged early with Indigenous communities to ensure that Indigenous Communities with territory along the Project route are informed about the Project and its potential impacts, and are encouraged to provide input. FEI's early engagement also provided an opportunity for FEI to understand the interests of Indigenous communities in the area and potential impacts of the Project on those interests.

As detailed above, FEI has notified each identified Indigenous community about the Project. In many cases FEI was able to arrange for meetings with the communities. FEI also sent any requested information to the communities if available. For those requests that require greater detail than is currently available, FEI has committed to ongoing engagement through follow up

meetings to share relevant information as it becomes available. All Indigenous communities will be sent a follow up letter advising them of the filing of this CPCN application.

The Project is at an early stage and, as the Project progresses into later stages, FEI will continue to work with Indigenous communities to keep them apprised of new developments including all follow up commitments. The identified Indigenous communities will also have a number of additional opportunities to comment on Project-specific impacts. During the BC OGC permitting process that will occur prior to construction, much more detailed Project information will be provided to the Indigenous communities for review and comment including up-to-date shape files, maps and environmental management plans. FEI supports consultation by the BC OGC by responding to technical questions where appropriate and attending meetings if requested.

9. PROVINCIAL GOVERNMENT ENERGY OBJECTIVES AND LONG TERM RESOURCE PLAN

9.1 *INTRODUCTION*

Section 46 (3.1) of the UCA states that in considering whether to issue a CPCN, the BCUC must consider:

(a) the applicable of British Columbia's energy objectives,

(b) the most recent long-term resource plan filed by the public utility under section 44.1, if any, and

(c) the extent to which the application for the certificate is consistent with the applicable requirements under sections 6 and 19 of the *Clean Energy Act* (CEA).

Sections 6 and 19 of the CEA, as referred to in (c) above, do not apply to FEI. FEI addresses the other two requirements below.

9.2 *BRITISH COLUMBIA'S ENERGY OBJECTIVES*

British Columbia's energy objectives are defined in section 2 of the CEA. Based on the results of the socio-economic evaluation described in Section 5.8.2, the Project will support the following British Columbia energy objective found in section 2(k) of the CEA:

to encourage economic development and the creation and retention of jobs

As described in Section 5.8.2, the construction of the Project will have positive employment impacts and will contribute to the local economy in the Lower Mainland, BC, Canada and economic spin-offs will be created, such as increased demand for local hospitality services.

9.3 *LONG TERM RESOURCE PLAN*

The Project is included in FEI's most recently filed long-term resource plan (LTRP). Referred to as the Transmission System Laterals In-Line Inspection Capability Project, the Project is described in section 6.4 of FEI's 2017 Long Term Gas Resource Plan (LTGRP) filed with the BCUC on December 14, 2017. At the time of filing the 2017 LTGRP, FEI was originally anticipating that the implementation of in-line inspection would be the primary means to mitigate the potential for rupture associated with corrosion on the laterals. Through further exploration of alternatives available to FEI, several other alternatives have since proven to be more cost-effective, as discussed in detail in Section 4 of this Application. The Project remains consistent with the 2017 LTGRP.

10. CONCLUSION

The IGU Project is necessary to mitigate the potential for rupture due to corrosion on the 29 Transmission Laterals. Due to the presence of CP shielding of FEI's pipeline system, FEIs current method of using Modified ECDA to assess these laterals will not detect sites that may be experiencing active corrosion. Modified ECDA is therefore no longer acceptable to manage the integrity of these lines over the long term.

The Project is proposing integrity management solutions as alternatives to Modified ECDA, including ILI, PLR, and PRS. FEI evaluated each lateral on a case-by-case basis in consideration of multiple factors, including Project execution, technical performance and cost over a 66-year period. The preferred alternative for each lateral is listed below in Table 10-1. The proposed solutions will achieve the objective of mitigating the potential for rupture due to corrosion while also being cost effective over a 66-year analysis period.

Table 10-1: Preferred Alternatives for Each Lateral

Line/ Loop ID No.	Line/Loop Full Name	Line Length (km)	Preferred Alternative
1	MACKENZIE LATERAL 168	28.6	In-line Inspection
2	MACKENZIE LOOP 168	14.2	In-line Inspection
3	BC FOREST PRODUCTS LATERAL 168	0.5	Pipeline Replacement
4	PRINCE GEORGE 3 LATERAL 219	5.3	Pressure Regulating Station
5	NORTHWOOD PULP LATERAL 168	6.0	Pressure Regulating Station
6	NORTHWOOD PULP LOOP 219	5.8	Pressure Regulating Station
7	PRINCE GEORGE #1 LTL 168	4.7	In-line Inspection
8	PRINCE GEORGE PULP LATERAL 168	1.0	Pressure Regulating Station
9	HUSKY OIL LATERAL 168	1.1	Pressure Regulating Station
10	PRINCE GEORGE #2 LATERAL 219	8.6	Pressure Regulating Station
11	CARIBOO PULP LATERAL 168	1.3	Pipeline Replacement
12.1	WILLIAMS LAKE LOOP 168	3.4	Pressure Regulating Station
12.2	WILLIAMS LAKE LOOP 168	2.5	Pressure Regulating Station
13.1	KAMLOOPS 1 LATERAL 168	3.6	Pipeline Replacement
13.2	KAMLOOPS 1 LOOP 168	3.1	Pipeline Replacement
14	SALMON ARM LOOP 168	44.9	In-line Inspection
15	SALMON ARM 3 LATERAL	0.8	Pipeline Replacement
16	COLDSTREAM LAT 219	1.8	Pressure Regulating Station
17	COLDSTREAM LOOP 168	3.8	Pressure Regulating Station

Line/ Loop ID No.	Line/Loop Full Name	Line Length (km)	Preferred Alternative
18	KELOWNA 1 LOOP 219	2.1	Pressure Regulating Station
19	CELGAR LATERAL 168	5.8	Pressure Regulating Station
20	CASTLEGAR NELSON 168	37.4	Pressure Regulating Station
21	TRAIL LATERAL 168	4.2	Pressure Regulating Station
22.1	FORDING LATERAL 219	34.5	In-line Inspection
22.2	FORDING LATERAL 168	45.1	In-line Inspection
23	ELKVIEW LATERAL 168	1.6	Pressure Regulating Station
24	CRANBROOK LATERAL 168	34.0	In-line Inspection
25	CRANBROOK LOOP 219	34.0	In-line Inspection
26	CRANBROOK KIMBERLEY LOOP 219	4.0	In-line Inspection
27	CRANBROOK KIMBERLEY LOOP 273	9.4	In-line Inspection
28	KIMBERLY LATERAL 168	20.6	In-line Inspection
29	SKOOKUMCHUCK LATERAL 219	35.9	In-line Inspection

FEI plans to initiate detailed design in December 2018, procurement of long lead items for the Project beginning in Q1 2019, and to begin construction in early Q2 2020. The Project is planned to be completed in phases, with the last lateral scheduled to be in service by October 2024.

This Project, completed proactively over a reasonable planning horizon and in consideration of the feasibility and benefits of alternate integrity management strategies, demonstrates FEI's commitment to continual improvement within its integrity management program, and is an appropriate response to the potential for rupture failure due to corrosion.

Appendix A

DETAILED DESCRIPTION OF TWENTY NINE LATERALS

1.1 DETAILED DESCRIPTION OF TWENTY-NINE LATERALS

This appendix FEI provides a detailed overview of all 29 laterals as well as the alternatives evaluation of each lateral.

1.1.1 Mackenzie Lateral 168 (MAC LTL 168)

The Mackenzie Lateral 168 starts off of the Enbridge mainline near John Hart Highway and heads north to the town of Mackenzie, home to approximately 3500 residents. It operates together as a single system with the Mackenzie Loop 168 (described below in Section 1.1.2). This lateral has two water crossings – the Mischinsinlika Creek and Williston Lake. There are two large industrial customers being supplied from this lateral including Mackenzie Pulp Mill and Conifex Sawmill.

Length of Pipeline (kilometres)		28.6
Outside Diameter(s) (millimetres)		168, 88
Year of Construction		1966
Right of way width (metres)		10
Number of Customers	**Residential**	1,672
	Commercial	139
	Industrial	6
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Overhead BC Hydro power lines at ILI Receiver assembly site Property: • Acquisition of ROW Indigenous Community Consultation: • Blueberry River First Nation • West Moberly First Nation • Halfway River First Nation • Doig River First Nation • MacLeod Lake Indian Band Environmental: • Wetlands • Mischinsinlika Creek crossing • Registered contaminated sites • Raptor nests nearby • Amphibian breeding habitat Archaeological: • Moderate to high archaeological potential

FEI recommends ILI as the preferred alternative for the Mackenzie Lateral 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.

The financial analysis of ILI for the Mackenzie Lateral 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	39,056
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	2,266
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	2,754
PV of Incremental Revenue Requirement - 66 years ($000s)	45,803
Levelized Delivery Rate Impact - 66 years (%)	0.33%

With ILI at this lateral, there will be a Launcher assembly and a Control Valve assembly at the start of the lateral and a Receiver assembly just east of Old Airport Road. In order to have a continuous in-line inspection from the start of the lateral to the end, another 168 millimetre crossing is planned to be installed at the Mischinsinlika Creek. Without this additional crossing, FEI would require another launcher and receiver assembly since the current crossing is 219 millimetres and would not be compatible with the 168 millimetre ILI tool.

1.1.2 Mackenzie Loop 168 (MAC LOP 168)

Similar to the Mackenzie Lateral 168, the Mackenzie Loop 168 starts off at the Enbridge Tap near John Hart Highway and completely loops the Mackenzie Lateral 168 to the start of the Mischinsinlika Creek crossing. The Mackenzie Loop then continues to loop the Mackenzie Lateral after the Mischinsinlika Creek crossing for another 2 kilometres where it terminates. The Mackenzie Lateral 168 and the Mackenzie Loop 168 operate together as a single system.

Length of Pipeline (kilometres)		14.2
Outside Diameter(s) (millimetres)		168, 219
Year of Construction		1972
ROW Width (metres)		10
Number of Customers	**Residential**	1,672
	Commercial	139

	Industrial	6
Important Factors in Execution and Lifecycle Operation		Property: • Acquisition of ROW Indigenous Community Consultation: • Blueberry River First Nation • West Moberly First Nation • Halfway River First Nation • Doig River First Nation • MacLeod Lake Indian Band Environmental: • Wetlands and creek crossings • Registered contaminated sites • Raptor nests nearby • Amphibian breeding habitat Archaeological: • Moderate to high archaeological potential

FEI recommends ILI as the preferred alternative for the Mackenzie Loop 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for Mackenzie Loop 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	22,437
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,418
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,168
PV of Incremental Revenue Requirement - 66 years ($000s)	24,932
Levelized Rate Impact - 66 years (%)	0.18%

With ILI at this lateral, there will be a 168 millimetre launcher assembly at the start of the loop and a 168 millimetre receiver assembly where the Mischinsinlika Creek crossing begins. There will also be a 219 millimetre launcher assembly at the start of the Creek crossing, and a 219 millimetre receiver assembly 2 kilometres downstream of the creek. In addition, approximately

160 metres of the Mackenzie Loop immediately downstream of the crossing will have to be upgraded from a pipe size of 168 millimetres to 219 millimetres.

1.1.3 BC Forest Products Lateral 168 (BCF LTL 168)

The BC Forest Products lateral is a short lateral that branches off of the Mackenzie Lateral just West of Coquiwaldy Road feeding Mackenzie Pulp Mill Corporation. The Mackenzie Lateral 168, the Mackenzie Loop 168 and the BC Forest Products Lateral 168 operate together as a single system.

Length of Pipeline (kilometres)		0.5
Outside Diameter(s) (millimetres)		168
Year of Construction		1970
ROW Width (metres)		N/A
Number of Customers	**Residential**	N/A
	Commercial	N/A
	Industrial	N/A
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Canadian National Railway crossing • Cannot take line out of service Property: • Currently no ROW, and will be requiring 18m ROW for the pipeline replacement Indigenous Community Consultation: • West Moberly First Nations • Halfway River First Nations • Doig River First Nations • MacLeod Lake Indian Band Environmental: • Registered contaminated sites

The financial comparison between the remaining alternatives of ILI, PLR and PRS for the BC Forest Products Lateral 168 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. Due to the fact that this is a relatively short lateral at approximately 0.5 kilometres, PLR is less expensive than ILI and PRS. Additionally, PLR has a smaller rate impact than ILI and PRS, with a lower total PV of incremental revenue requirement and levelized rate impact.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	9,242	4,663	5,317
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,903	-	1,527
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	675	-	20
PV of Incremental Revenue Requirement - 66 years ($000s)	12,598	4,537	6,955
Levelized Rate Impact - 66 years (%)	0.09%	0.03%	0.05%

The table below shows the scoring of each alternative for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.8	4.2	4.0
Financial	1.0	5.0	2.0
Overal Score	**3.3**	**4.7**	**2.8**

FEI recommends PLR as the preferred alternative for BC Forest Products Lateral. With the PLR alternative, the entire pipeline will be replaced.

1.1.4 Northwood Pulp Lateral 168

The Northwood Pulp Lateral begins at the Enbridge tap just north of the Fraser River near the Fraser-Fort George and Prince George boundary. This lateral is looped by Northwood Pulp Loop 168 (described in Section 1.1.5) for most of the lateral, and the two lines join to feed Prince George 3 Lateral (described in Section 1.1.6). Because of this configuration, the three pipelines were treated as a single system when evaluating alternatives. The Northwood Pulp Lateral continues south past the start of the Prince George 3 Lateral and supplies the Northwood Pulp Mill.

Length of Pipeline (kilometres)		6.0
Outside Diameter(s) (millimetres)		168
Year of Construction		1965
ROW Width (metres)		15
Number of Customers	**Residential**	17,716
	Commercial	1,834
	Industrial	52
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Assets will need to be installed on elevated

	platforms due to sites having flooded in the past • Existing tap has no odourization for about 600 meters • Cannot be taken out of service • Road crossings • Rail ROW Property: • Obtaining ROW on Enbridge property • One property owned by Canfor on last 400m Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Water crossings • Fraser River critical habitat for fish species at risk • Registered contaminated sites Archaeological: • High risk archaeology, no known site but proximity to water and reserve increases risk

The financial comparison between the remaining alternatives of ILI and PRS for the Northwood Pulp Lateral 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, and the lowest total PV of incremental revenue requirement and levelized rate impact when compared to ILI.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	12,174	1,760
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,902	481
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,088	6
PV of Incremental Revenue Requirement - 66 years ($000s)	15,379	2,201
Levelized Rate Impact - 66 years (%)	0.11%	0.02%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.3	4.3
Financial	1.0	5.0
Overal Score	**3.2**	**3.9**

FEI recommends PRS as the preferred alternative for the Northwood Pulp Lateral 168. Because Northwood Pulp Lateral feeds the Northwood Pulp Loop and Prince George 3, all three lines can be served by one PRS.

1.1.5 Northwood Pulp Loop 219

The Northwood Pulp Loop starts at the same point as the Northwood Pulp Lateral, and continues to the Prince George 3 Lateral, effectively bypassing the Northwood Pulp mill to boost the capacity of the supply feeding Prince George.

Length of Pipeline (kilometres)		5.8
Outside Diameter(s) (millimetres)		219
Year of Construction		1995
ROW Width (metres)		15
Number of Customers	**Residential**	17,716
	Commercial	1,834
	Industrial	52
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Swampy areas due and sites have flooded in the past • Assets will need to be installed on elevated platforms • Existing tap has no odourization for about 600 meters • Cannot be taken out of service • Road crossings • Rail ROW Property: • Obtaining ROW on Enbridge property • One property owned by Canfor on last 400m Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Water crossings • Fraser River critical habitat for fish species at risk

	• Registered contaminated sites Archaeological: • High risk archaeology, no known site but proximity to water and reserve increases risk

The financial comparison between the remaining alternatives of ILI and PRS for the Northwood Pulp Loop 219 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS is also the alternative with the lowest project capital cost. Additionally, PRS has the lowest impact to FEI's ratepayers in terms of the total PV of incremental revenue requirement and levelized rate impact over a 66-year analysis period when compared to ILI.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	11,470	1,758
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,311	481
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,061	6
PV of Incremental Revenue Requirement - 66 years ($000s)	14,056	2,198
Levelized Rate Impact - 66 years (%)	0.10%	0.02%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.4	4.3
Financial	1.0	5.0
Overal Score	**3.2**	**3.9**

As described in the Northwood Pulp Lateral description, PRS was chosen as the preferred alternative, and given that the Northwood Pulp Lateral 168, the Northwood Pulp Loop 168 and the Prince George 3 Lateral 219 are all treated as one system, PRS was selected as the preferred alternative for the Northwood Pulp Loop.

1.1.6 Prince George 3 Lateral 219

The Prince George 3 Lateral branches off of the Northwood Pulp Lateral, and begins just west of the intersection of Beaver Forest Road and Industrial Access Road to the North of Northwood

Pulp Mill. This lateral heads southwest and ends on Noranda Road near McMillian Creek. At Noranda Road is the start of an intermediate pressure pipeline which spans from the North end of Prince George to the South end where it connects to the Prince George 2 Lateral. Together, these two laterals support the entire City of Prince George, home to approximately 74,000 residents, and 31,000 FEI customers.

Length of Pipeline (kilometres)		5.3
Outside Diameter(s) (millimetres)		219
Year of Construction		1970
ROW Width (metres)		6
Number of Customers	**Residential**	17,716
	Commercial	1,834
	Industrial	52
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Swampy areas due and sites have flooded in the past • Assets will need to be installed on elevated platforms • Cannot take line out of service Property: • Narrow ROW • ROW in road along Old Summit Lake Road for 450m • Parallels BC Hydro ROW • Private and Crown land Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • McMillan Creek and other small creek crossings • Registered contaminated sites Archaeological: • Moderate to high archaeological potential with three areas confirmed high archaeological potential

The financial comparison between ILI and PRS for the Prince George 3 Lateral 219 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the

pipeline to meet customer demands. PRS has the lowest project capital cost, and the lowest total PV of incremental revenue requirement and levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	11,785	1,753
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,305	479
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,031	6
PV of Incremental Revenue Requirement - 66 years ($000s)	14,315	2,191
Levelized Rate Impact - 66 years (%)	0.10%	0.02%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.5	4.6
Financial	1.0	5.0
Overal Score	**3.2**	**4.0**

As described in the Northwood Pulp Lateral and Loop descriptions, PRS was recommended as the preferred alternative for the system. Since the Prince George 3 Lateral is supplied by Northwood Pulp Lateral and Loop, FEI recommends PRS as the preferred alternative for this lateral. In addition, PRS has an added benefit of lower potential impacts to surrounding Indigenous communities compared to ILI.

1.1.7 Prince George 1 Lateral 168

The Prince George 1 Lateral taps off of Enbridge south of the Graves Road and Shelley Road intersection. The lateral continues west and ends near Pickering Road where it connects to the Prince George Pulp Lateral (described in Section 1.1.8) and subsequently Husky Oil Lateral (described in Section 1.1.9). Together, the laterals supply gas to 1229 customers, with several significant industrial customers.

Length of Pipeline (kilometres)		4.7
Outside Diameter(s) (millimetres)		168
Year of Construction		1957
ROW Width (metres)		18
Number of	**Residential**	1,171

Customers	**Commercial**	50
	Industrial	8
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Stopping off and welding fittings at a higher pressure to maintain customer gas requirements Property: • Obtaining ROW on Enbridge property Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Creek crossings • Potential for occurrence of a plant species at risk • Registered contaminated sites Archaeological: • Moderate to high archaeological potential

FEI recommends ILI as the preferred alternative for the Prince George 1 Lateral 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Prince George 1 Lateral 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	11,975
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,873
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	601
PV of Incremental Revenue Requirement - 66 years ($000s)	14,153
Levelized Rate Impact - 66 years (%)	0.10%

With ILI for this lateral, a launcher assembly and a control valve assembly will be installed at the start of the Prince George 1 Lateral, and a receiver assembly where the Prince George 1 Lateral terminates and the Prince George Pulp Lateral starts.

1.1.8 Prince George Pulp Lateral 168

The Prince George Pulp Lateral continues where the Prince George 1 Lateral (described in Section 1.1.7) terminates. This lateral crosses the Fraser River and feeds Canfor Pulp mill. This lateral also connects directly to the Husky Oil Lateral (described in Section 1.1.9). Consideration was given to treating Prince George 1 Lateral, Prince George Pulp Lateral and Husky Oil Lateral. However, since PRS was not feasible on Prince George 1 Lateral, it was not evaluated as a system. Prince George Pulp Lateral and Husky Oil Lateral however, were evaluated as a system.

Length of Pipeline (kilometres)		1.0
Outside Diameter(s) (millimetres)		168
Year of Construction		1964
ROW Width (metres)		0*
Number of Customers	**Residential**	1,171
	Commercial	50
	Industrial	8
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Fraser River crossing • Steep slope at the start of the lateral to the river crossing • Stopping off and welding fittings at a higher pressure to maintain customer gas requirements • CN Bridge crossing Property: • No existing R/W in place • Works within rail corridor Limited space on the Canfor Pulp mill where the lateral ends Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Fraser River crossing • Mature forested riparian area associated with the Fraser River. • Potential for occurrence of a plant species at risk • Registered contaminated sites

	Archaeological: • Moderate to high archaeological potential

** No existing ROW, lateral is located within railway corridor and FEI has a License to Operate*

The financial comparison between the remaining alternatives of ILI, PLR, and PRS for the Prince George Pulp Lateral 168 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. Because Prince George Pulp Lateral and Husky Oil Lateral are treated as a system, the PRS is shared between the two, resulting in a lower project capital cost, lower PV of incremental revenue requirement, and lower rate impact than the other alternatives.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	11,664	8,384	2,938
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,836	-	769
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	680	-	9
PV of Incremental Revenue Requirement - 66 years ($000s)	14,331	7,381	3,600
Levelized Rate Impact - 66 years (%)	0.10%	0.05%	0.03%

The table below shows the scoring of each alternative for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.5	3.3	3.8
Financial	1.0	1.0	5.0
Overal Score	**3.2**	**3.1**	**3.8**

FEI recommends PRS as the preferred alternative for Prince George Pulp lateral, and subsequently Husky Oil Lateral. One PRS will be installed at the start of the Prince George Pulp Lateral and will be able to serve Husky Oil Lateral as well.

1.1.9 Husky Oil Lateral 168

The Husky Oil Lateral continues from Canfor Pulp where the Prince George Pulp Lateral ends, and continues north where it runs parallel to Prince George Pulpmill Road. This lateral supplies gas for significant industrial customers including Husky Oil and FMC.

Length of Pipeline (kilometres)		1.1
Outside Diameter(s) (millimetres)		168
Year of Construction		1967
ROW Width (metres)		0*
Number of Customers	**Residential**	1,171
	Commercial	50
	Industrial	8
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • BC Railway crossing • Stopping off and welding fittings at a higher pressure to maintain customer gas requirements • Pipeline in road allowance runs between buried NPS 42 water pipeline on south side and Husky facility on north side Property: • ROW required at the end of the lateral • Limited land at end of NPS 6 lateral • Existing pipe within road allowance Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Registered contaminated site • 1 osprey nest nearby • Potential for occurrence of a plant species at risk Archaeological: • Moderate to high archaeological potential

** Pipe located in road allowance so no ROW exists for this lateral*

The financial comparison between the remaining alternatives of ILI, PLR, and PRS for the Husky Oil Lateral 168 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. Because the PRS is shared between Prince George Pulp Lateral and Husky Oil Lateral, it has the lowest project capital cost, and the lowest total PV of incremental revenue requirement and levelized rate impact when compared to other alternatives.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	14,440	5,956	2,939
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,252	-	770
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	682	-	9
PV of Incremental Revenue Requirement - 66 years ($000s)	16,392	5,487	3,601
Levelized Rate Impact - 66 years (%)	0.12%	0.04%	0.03%

The table below shows the scoring of each alternative for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.5	3.3	3.8
Financial	1.0	2.0	5.0
Overal Score	**3.2**	**3.5**	**3.8**

FEI recommends PRS as the preferred alternative based on financial scoring and the evaluation of Prince George Pulp lateral and Husky Oil lateral as a single system. The PRS option is achievable with one PRS at the start of Prince George Pulp lateral to serve Husky Oil Lateral as well since the two laterals are connected sequentially.

1.1.10 Prince George 2 Lateral 219

The Prince George 2 Lateral begins near the intersection of Evasko Road and Johnson Road and heads west until it ends at Highway 97 and Terminal Boulevard. A Gate Station at Highway 97 and Terminal Boulevard feeds the intermediate pressure pipeline that connects with the supply from Noranda Gate Station supplied from the Prince George 3 Lateral. As described previously, these two laterals are critical for supplying gas to the city of Prince George.

Length of Pipeline (kilometres)		8.6
Outside Diameter(s) (millimetres)		219
Year of Construction		1965
ROW Width (metres)		6
Number of Customers	**Residential**	17,217
	Commercial	1,596
	Industrial	44
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Cannot take offline

	• Road crossing • ROW in road allowance with high traffic near PG Airport Property: • All private land Indigenous Community Consultation: • Nak'azdli Whut'en' • Nazko First Nation • Carrier Chilcotin Tribal council • Lheidli – T'enneh Band Environmental: • Stream crossings Archaeological: • Moderate to high archaeological potential with three areas confirmed high archaeological potential

The financial comparison between the remaining alternatives of ILI and PRS for the Prince George 2 Lateral 219 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, the lowest total PV of incremental revenue requirement, and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	12,384	5,157
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,922	1,365
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,283	18
PV of Incremental Revenue Requirement - 66 years ($000s)	15,839	6,342
Levelized Rate Impact - 66 years (%)	0.11%	0.05%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.7	4.3
Financial	1.0	5.0
Overal Score	**3.3**	**3.9**

FEI recommends PRS as the preferred alternative for the Prince George 2 Lateral 168. With this alternative, the PRS would be installed at the start of the lateral near the Enbridge tap.

1.1.11 Cariboo Pulp Lateral 168

The Cariboo Pulp Lateral begins near the North end of North Star Road in Quesnel and continues west to feed Cariboo Pulp & Paper, the sole customer served by the lateral.

Length of Pipeline (kilometres)		1.3
Outside Diameter(s) (millimetres)		168
Year of Construction		1972
ROW Width (metres)		10
Number of Customers	**Residential**	N/A
	Commercial	N/A
	Industrial	N/A
Important Factors in Execution and Lifecycle Operation		Property: • Additional ROW required Indigenous Community Consultation: • Tsihlqot'in National Government • Carrier Chilcotin Tribal Council • Lhtako Dene Nation • Lhoosk'uz Dene Nation • Ulkatcho First Nation Environmental: • Registered contaminated site • Occurrence of a plant species at risk Archaeological: • Moderate to high archaeological potential

The financial comparison between the remaining alternatives of ILI, PLR, and PRS for the Cariboo Pulp Lateral 168 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. Although PLR has a higher capital cost compared to PRS, PLR has similar rate impacts as PRS primarily due to the additional sustainment capital and O&M costs required for the PRS in the future.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	7,119	5,332	4,888
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,915	-	1,443
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	711	-	20
PV of Incremental Revenue Requirement - 66 years ($000s)	10,507	5,252	6,487
Levelized Rate Impact - 66 years (%)	0.08%	0.04%	0.05%

The table below shows the scoring of ILI, PLR, and PRS for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.3	3.3	4.3
Financial	1.0	5.0	3.0
Overal Score	**3.2**	**4.5**	**3.2**

FEI recommends PLR as the preferred alternative for the Cariboo Pulp lateral as this alternative has the highest overall score. PLR is lower in terms of total PV of incremental revenue requirements over the 66-year analysis period.

PRS scored lower than PLR since the technical performance is not as high due to the fact that PRS would still be managing a vintage pipe. Since PLR is not the least expensive alternative, subject matter experts were called upon to provide input on alternatives for this lateral and concluded PLR will offer better technical superiority over PRS since it will be a new pipeline with modern coating while the PRS alternative will still be maintain a vintage pipeline, therefore, PLR was selected as the preferred alternative.

1.1.12 Williams Lake Loop 1/Loop 2 168

The Williams Lake Loop begins south of Lund Road approximately 1 kilometre east of Minton Lake, where it ties into the Williams Lake Lateral 114. The loop heads towards the Williams Lake Airport and continues along Jacobson Road and ends just north of Kemp Road where the 114 lateral continues toward the City of Williams Lake, home to approximately 11,000 residents.

Length of Pipeline (kilometres)	Williams Lake Loop 1	Williams Lake Loop 2
Length of Pipeline (kilometres)	3.4	2.5
Outside Diameter(s) (millimetres)	168	168
Year of Construction	1993	1998
ROW Width (metres)	6	6

Number of Customers	**Residential**	5,998
	Commercial	813
	Industrial	15
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Several road crossings • Crosses airport runway Property: • All land in Agricultural Land Reserve Indigenous Community Consultation: • Xats'ull First Nation • Northern Secwepemc Tribal Council • Canim Lake Band • Neskonlith Indian Band • Tsihlqot'in National Government • Williams Lake Indian Band Environmental: • Stream and wetland crossings • Registered contaminated site • Old Growth Management Areas Archaeological: • Moderate to high archaeological potential

The financial comparison between the remaining alternatives of ILI and PRS for the Williams Lake Loop 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest total PV of incremental revenue requirement, and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	13,391	5,066
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,833	1,343
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,025	18
PV of Incremental Revenue Requirement - 66 years ($000s)	15,692	5,951
Levelized Rate Impact - 66 years (%)	0.11%	0.04%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.5	4.3
Financial	1.0	5.0
Overal Score	**3.2**	**3.9**

FEI recommends PRS as the preferred alternative for the Williams Lake Loop 168. With this alternative, the PRS would be installed on the Williams Lake 114 Lateral to simultaneously reduce the operating pressure of both the Williams Lake lateral and loop.

ILI was not selected due to the significantly higher rate impact as a result of higher incremental cost for the required assemblies. There are also potential difficulties in land acquisition in the Agricultural Land Reserve for ILI.

1.1.13 Kamloops Lateral/Loop 168

The Kamloops Lateral and Loop begin near Hillside Drive and copperhead Drive in the Dufferin neighbourhood, where it heads north to feed the Kamloops Gate Station which supplies the City of Kamloops, home to approximately 90,000 residents. A significant industrial customer on this lateral is the Domtar Pulp Mill.

Length of Pipeline (kilometres)		Kamloops 1 Lateral 168	Kamloops 1 Loop 168
Length of Pipeline (kilometres)		3.6	3.1
Outside Diameter(s) (millimetres)		168	168
Year of Construction		1965	1979
ROW Width (metres)		6-12	6-12
Number of Customers	**Residential**	15,391	
	Commercial	1,588	
	Industrial	36	
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Difficult terrain with steep slopes Property: • Park Use Permit required Indigenous Community Consultation: • Adams Lake Indian Band • Ashcroft Indian Band • Little Shuswap Lake Indian Band • Bonaparte Indian Band • Whispering Pines/ Clinton Band • Neskonlith Indian Band • Nooaitch Indian Band	

	• Esh-kn-am Cultural Resources • Boothroyd Indian Band • Spuzzum First Nation • Skuppah Indian Band • Nlaka'pamux Nation Tribal Council • Nicola Tribal Association • Lower Nicola Indian Band • Lytton First Nation • Siska Indian Band • Cook's Ferry Indian Band • Coldwater Indian Band • Oregon Jack Creek Indian Band • Skeetchestn Indian Band • Tk'emlups Band • Stk'emlupsemc te Secwepemc Nation (SSN) Environmental: • Critical habitat for woodpecker, toad and snake • Occurrences of species at risk • Pipeline runs through municipal Kenna Cartwright Park Archaeological: • Assessment required within park boundary • Heritage site nearby • Three areas of high archaeological potential confirmed

The financial comparison between the remaining alternatives of ILI and PLR for the Kamloops 1 Lateral & Loop 168 is shown in the table below. PLE, HSTP and PRS were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. Between ILI and PLR, PLR has a lower project capital cost and lower total PV of incremental revenue requirement and levelized rate impact.

	ILI	PLR
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	29,222	18,008
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,921	-
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,120	-
PV of Incremental Revenue Requirement - 66 years ($000s)	32,104	16,289
Levelized Rate Impact - 66 years (%)	0.23%	0.12%

The table below shows the scoring of ILI and PLR for each of the three criteria, and the overall weighted score:

	ILI	PLR
Integrity and Asset Management Capabilities	4.8	4.7
Project Execution & Lifecycle Operation	3.5	3.6
Financial	2.0	5.0
Overal Score	**3.6**	**4.6**

FEI recommends PLR as the preferred alternative for the Kamloops 1 Lateral and Loop 168.

1.1.14 Salmon Arm Loop 168

The Salmon Arm Loop 168 begins on the Savona-Nelson Mainline of the FEI Interior Transmission System just east of St Annes Road in the township of Spallumcheen, where it heads north towards Armstrong along Otter Lake Road. From Armstrong, the loop continues along Vernon Sicamous Highway to Enderby and from Enderby towards Salmon Arm where the loop ends. The loop is also critical to serving the communities north of Salmon Arm, as far as Sorrento. The populations of Spallumcheen, Armstrong, Enderby, and Salmon Arm total more than 31,000 combined.

Length of Pipeline (kilometres)		44.9
Outside Diameter(s) (millimetres)		168
Year of Construction		1976-1987
ROW Width (metres)		3-9
Number of Customers	**Residential**	11,830
	Commercial	1,136
	Industrial	24
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Crosses Vernon Sicamous Highway Property: • Potential trespass issue in Splats'in First Nation reserve • Private property • Log barn property (ROW encroachment) • First Nations land tenure (28.2 permit) Indigenous Community Consultation: • Neskonlith Indian Band • Okanagan Nation Alliance • Penticton Indian Band • Upper Nicola Indian Band • Lower Similkameen Indian Band • Okanagan Indian Band • Adams Lake Indian Band • Little Shuswap Lake Indian Band • Splats'in First Nation Environmental:

	• Critical habitat for great basin spadefoot • Osprey and hawk nests nearby • Great blue heron rookery • Species at risk occurrences • Amphibian breeding habitats • Registered contaminated site Archaeological: • Moderate to high archaeological potential with two areas of high archaeological potential confirmed

FEI recommends ILI as the preferred alternative for the Salmon Arm Loop 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Salmon Arm Loop 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	30,392
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	2,247
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	3,592
PV of Incremental Revenue Requirement - 66 years ($000s)	33,567
Levelized Rate Impact - 66 years (%)	0.24%

With ILI for this lateral, there will be a launcher and a control valve assembly at the start of the loop, and a receiver assembly at the Salmon Arm Gate Station where the loop terminates.

1.1.15 Salmon Arm 3 Lateral 168

The Salmon Arm 3 Lateral starts off of the Salmon Arm 114 Lateral just East of Shaw Road in Salmon Arm at the Canoe Creek golf course. From there it heads north and ends near the Auto Road SE and 6 Street SE intersection.

Length of Pipeline (kilometres)	0.8
Outside Diameter(s) (millimetres)	168
Year of Construction	1981
ROW Width (metres)	9

Number of Customers	**Residential**	3,426
	Commercial	261
	Industrial	9
Important Factors in Execution and Lifecycle Operation		Property: • Crosses Canoe Creek golf course Indigenous Community Consultation: • Neskonlith Indian Band • Okanagan Nation Alliance • Penticton Indian Band • Upper Nicola Indian Band • Lower Similkameen Indian Band • Okanagan Indian Band • Adams Lake Indian Band • Little Shuswap Lake Indian Band • Splats'in First Nation Archaeological: • One area of high archaeological potential confirmed

The financial comparison between the remaining alternative of ILI and PLR for the Salmon Arm 3 Lateral 168 is shown in the table below. PLE, HSTP and PRS were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. As this is a relatively short pipeline, PLR has a lower project capital cost, lower PV of incremental revenue requirement and levelized rate impact when compared to ILI.

	ILI	PLR
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	7,136	4,014
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,893	-
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	705	-
PV of Incremental Revenue Requirement - 66 years ($000s)	10,493	3,821
Levelized Rate Impact - 66 years (%)	0.08%	0.03%

The table below shows the scoring of each ILI and PLR for each of the three criteria, and the overall weighted score:

	ILI	PLR
Integrity and Asset Management Capabilities	4.8	4.7
Project Execution & Lifecycle Operation	2.8	3.3
Financial	1.0	5.0
Overal Score	**3.1**	**4.5**

FEI recommends PLR as the preferred alternative for the Salmon Arm 3 Lateral. Because of where the lateral located relative to the Canoe Creek golf course, PLR will have less impact both during and post-construction than ILI.

1.1.16 Coldstream Loop 168

The Coldstream Loop 168 starts about 400 metres east of Apollo Road in Vernon on the Savona-Penticton Mainline of the FEI Interior Transmission System, and heads directly east to where it joins the start of the Coldstream Lateral 219 (described in Section 1.1.17). Because the loop and lateral are connected, the two are treated as a single system in the evaluation of alternatives.

Length of Pipeline (kilometres)		3.8
Outside Diameter(s) (millimetres)		168
Year of Construction		1989
ROW Width (metres)		9
Number of Customers	**Residential**	13,357
	Commercial	1,017
	Industrial	48
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Unexploded ordnances along ROW • Crosses highway 97 and Okanagan college campus Property: • Crosses Vernon Golf and Country Club course Indigenous Community Consultation: • Neskonlith Indian Band • Penticton Indian Band • Upper Nicola Indian Band • Okanagan Nation Alliance • Okanagan Indian Band • Lower Similkameen Indian Band Splats'in First Nation Environmental: • Critical habitat for great basin spadefoot and two species of snake • Stream crossings • Species at risk occurrences • Registered contaminated site

	Archaeological: • Moderate to high archaeological potential with six areas of high archaeological potential confirmed

The financial comparison between the remaining alternatives of ILI and PRS for the Coldstream Loop 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest PV of incremental revenue requirement, and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	12,077	5,102
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,791	1,348
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	847	18
PV of Incremental Revenue Requirement - 66 years ($000s)	14,241	6,019
Levelized Rate Impact - 66 years (%)	0.10%	0.04%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.2	4.3
Financial	1.0	5.0
Overal Score	**3.1**	**3.9**

FEI recommends PRS as the preferred alternative for the Coldstream Loop 168. PRS is the alternative with the highest overall score for the Coldstream Loop 168 and the Coldstream Lateral 219 thus PRS is the preferred alternative for both lines. With this alternative, the PRS would be installed at the start of the Coldstream Loop 168.

ILI was screened out due to higher rate impact as a result of the length of the loop and greater complexity due to the road crossing and unexploded ordinances which lead to lower project execution scores.

1.1.17 Coldstream Lateral 219

The Coldstream Lateral 219 starts off on Reservoir Road in Vernon and heads north on the West side of the Vernon Golf and Country Club. The lateral ends off just south of Polson Drive and 14 Avenue. From here, an intermediate pressure pipeline travels along Highway 6 eastbound where it supplies Coldstream. The District of Coldstream is home to approximately 10,000 residents.

Length of Pipeline (kilometres)		1.8
Outside Diameter(s) (millimetres)		219, 114
Year of Construction		1998
ROW Width (metres)		15
Number of Customers	**Residential**	13,357
	Commercial	1,017
	Industrial	48
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Creek crossing Property: • Crosses Vernon Golf and Country Club course • Access required for FLNRO tree farm Indigenous Community Consultation: • Neskonlith Indian Band • Penticton Indian Band • Upper Nicola Indian Band • Okanagan Nation Alliance • Okanagan Indian Band • Lower Similkameen Indian Band • Splats'in First Nation Environmental: • Critical habitat for great basin spadefoot and two species of snake • Stream crossings including a creek which leads to Kalamalka Lake • Species at risk occurrences • Registered contaminated site Archaeological: • Moderate to high archaeological potential with six areas of high archaeological potential confirmed

The financial comparison between the remaining alternatives of ILI, PLR, and PRS for the Coldstream Lateral 219 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a viable alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. AACE Class 3 estimates were

developed for all three alternatives as the project capital costs were relatively close to each other. At a lateral length of approximately 1.8 kilometres, all three alternatives are relatively comparable financially with PRS having the lowest PV of incremental revenue requirement and levelized rate impact. PLR has the highest project capital cost, but has lower rate impact than ILI due to the fact that ILI requires future capital and O&M expenditures for ILI re-inspection.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	11,123	10,514	5,029
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,765	-	1,333
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	688	-	18
PV of Incremental Revenue Requirement - 66 years ($000s)	13,159	8,475	5,933
Levelized Rate Impact - 66 years (%)	0.10%	0.06%	0.04%

The table below shows the scoring of ILI, PLR, and PRS for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.3	3.2	4.3
Financial	1.0	3.0	5.0
Overal Score	**3.2**	**3.8**	**3.9**

Based on the scoring and the treatment of Coldstream Lateral and Loop as one system, FEI recommends PRS as the preferred alternative for the Coldstream Lateral 219. The PRS will be installed at the start of Coldstream Lateral 114 since this lateral supplies the Coldstream Lateral 219. Even though Coldstream Lateral 114 is not part of the 29 laterals in this project, it would be prudent to install the PRS at the start of the 114 Lateral because there will be little or no additional costs to apply pressure reduction to Coldstream Lateral 114. This would also be beneficial because it would reduce the Coldstream 114 lateral below 30 percent SMYS as well, preventing rupture potential of that section of pipe. The smaller footprint of the PRS compared to ILI and PLR is desirable due to environmental concerns.

ILI and PLR were both screened out by the financial analysis due to the length of the lateral and complexity including stream crossing and environmental risks.

1.1.18 Kelowna 1 Loop 219

The Kelowna 1 Loop begins on the corner of the Wal-Mart parking lot at the intersection of Enterprise Way and Banks Road. From there, the loop heads west until it ends at Alphonse Road. The City of Kelowna is home to approximately 128,000 residents.

Length of Pipeline (kilometres)		2.1
Outside Diameter(s) (millimetres)		219
Year of Construction		1976
ROW Width (metres)		15
Number of Customers	**Residential**	29,999
	Commercial	3,235
	Industrial	48
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Road crossing Property: • High land value • Walmart parking lot Indigenous Community Consultation: • Esh-kn-am Cultural Resources Management Services • Nooaitch Indian Band • Okanagan Nation Alliance • Penticton Indian Band • Upper Nicola Indian Band • Lower Similkameen Indian Band Okanagan Indian Band Environmental: • Riparian areas • Species at risk occurrences • At risk plant communities • Mill Creek fish bearing stream • Meadowbrook community garden • Registered contaminated site Archaeological: • Moderate to high archaeological potential

The financial comparison between the remaining alternatives of ILI and PRS for the Kelowna 1 Loop 219 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest PV of incremental revenue requirement, and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	12,008	5,891
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,769	1,348
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	692	18
PV of Incremental Revenue Requirement - 66 years ($000s)	13,969	6,902
Levelized Rate Impact - 66 years (%)	0.10%	0.05%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	2.8	4.3
Financial	1.0	5.0
Overal Score	**3.1**	**3.9**

FEI recommends PRS as the preferred alternative for the Kelowna 1 Loop 219. Since Kelowna 1 Loop 219 is connected to Kelowna 1 Lateral 114, the PRS will affect both lines and as a result, will need to regulate the pressure in both of the lines.

ILI was not suitable for this location due to the high profile location. It would be difficult to install and operate a launcher and control valve assembly in the Walmart parking lot, resulting in the low score for Project Execution and Lifecycle Operation.

1.1.19 Celgar Lateral 168

The Celgar Lateral 168 begins west of Columbia Ave and 11st in the City of Castlegar, home to approximately 8000 residents. From here the lateral heads West right up to serve the Zellstoff Celgar Pulp Mill.

Length of Pipeline (kilometres)		5.8
Outside Diameter(s) (millimetres)		168
Year of Construction		1960
ROW Width (metres)		12-18
Number of Customers	**Residential**	N/A
	Commercial	N/A
	Industrial	2
Important Factors in Execution and		Operational Complexity:

Lifecycle Operation	• Very steep terrain • Adjacent to BC Hydro ROW Property: • Private and crown land Indigenous Community Consultation: • Adam Lake • Neskonlith Indian Band • Penticton Indian Band • Upper Nicola Indian Band • Okanagan Nation Alliance • Lower Similkameen Indian Band • Okanagan Indian Band • Splats'in First Nation • Osoyoos Indian Band Shuswap Indian Band Environmental: • Stream crossings • An area of old forest • Species at risk occurrences • Wildlife habitat area 8-373 for Grizzly bear • Ungulate winter range 4-001 Archaeological: Moderate to high archaeological potential

The financial comparison between the remaining alternatives of ILI and PRS for the Celgar Lateral 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest PV of incremental revenue requirement and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	10,176	5,376
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,220	1,278
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	988	18
PV of Incremental Revenue Requirement - 66 years ($000s)	11,731	5,898
Levelized Rate Impact - 66 years (%)	0.09%	0.04%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.5	4.0
Financial	2.0	5.0
Overal Score	**3.6**	**3.8**

FEI recommends PRS as the preferred alternative for Celgar lateral 168. The PRS would be located downstream of the Celgar take off so the pressure regulation does not affect the Castlegar Nelson lateral.

1.1.20 Castlegar Nelson 168

The Castlegar Nelson 168 begins just north of Columbia Ave and 11st in the City of Castlegar, home to approximately 8,000 residents. This lateral continues north all the way to the City of Nelson, home to 11,000 residents.

Length of Pipeline (kilometres)		37.4
Outside Diameter(s) (millimetres)		168
Year of Construction		1957
ROW Width (metres)		12-18
Number of Customers	**Residential**	9,657
	Commercial	10
	Industrial	61
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Highway crossing Property: • Private and crown land • Need to verify municipal land • New HDD for river crossing • Very sloped terrain Indigenous Community Consultation: • Adam Lake • Neskonlith Indian Band • Penticton Indian Band • Upper Nicola Indian Band • Okanagan Nation Alliance • Lower Similkameen Indian Band • Okanagan Indian Band • Splats'in First Nation • Osoyoos Indian Band Shuswap Indian Band Environmental: • Brilliant river crossing • Shoreacres river crossing • Stream and wetland crossings

	• Fish species at risk • Critical habitat for caribou and woodpecker • Areas of old forest • Species at risk occurrences • Wildlife habitat area 8-373 for Grizzly bear • Ungulate winter range 4-001 • Registered contaminated sites Archaeological: • Large archaeological sites near Brilliant Dam • Archaeological sites near Kootenay River and Slocan River intersect • Registered arch sites on Zuckerberg Island • Moderate to high archaeological potential

The financial comparison between the remaining alternatives of ILI and PRS for the Castlegar Nelson 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest PV of incremental revenue requirement and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	53,656	8,343
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	2,162	1,805
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	3,799	18
PV of Incremental Revenue Requirement - 66 years ($000s)	54,183	8,986
Levelized Rate Impact - 66 years (%)	0.39%	0.07%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.2	4.0
Financial	1.0	5.0
Overal Score	**3.2**	**3.8**

FEI recommends PRS as the preferred alternative for the Castlegar Nelson 168. With this alternative, there will be a PRS downstream of the Celgar lateral so that the pressure regulation of Castlegar Nelson 168 does not affect the Celgar lateral. In addition, a span of 400 m of 219

millimetre pipe will be replaced with 168 millimetre pipe so that the entire Castlegar Nelson lateral will be operating below 30 percent SMYS.

ILI was not recommended for this lateral due to the challenging terrain as well as the significantly higher incremental cost, which resulted in an overall lower score for these alternatives.

1.1.21 Trail Lateral 168

The Trail Lateral 168 starts about 1.6 kilometres west of Rivervale. This lateral travels south along Aldridge Ave and heads west, ending just north of Bingay Road. This lateral serves Teck Trail Operations, Teck Cominco, the City of Trail and the village of Warfield. Trail is home to approximately 7800 residents and Warfield home to 1800 residents.

Length of Pipeline (kilometres)		4.2
Outside Diameter(s) (millimetres)		168
Year of Construction		1957
ROW Width (metres)		9-12
Number of Customers	**Residential**	3,205
	Commercial	310
	Industrial	7
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Highway ROW road allowance Property: • Teck/Cominco property, have had challenges with permission to work on property in the past Indigenous Community Consultation: • Penticton Indian Band • Upper Nicola Indian Band • Okanagan Nation Alliance • Lower Similkameen Indian Band • Okanagan Indian Band • Splats'in First Nation • Osoyoos Indian Band • Shuswap Indian Band • Akisqnuk First Nation • Lower Kootenay Band • Aq'am Community Government • Tobacco Plains Indian Band • Ktunaxa Nation Council Environmental: • Stream and wetland crossings • Wildlife habitat areas 8-373 for Grizzly bear • Ungulate winter range 4-001 • Registered contaminated site

	Archaeological: • One archaeological site identified • Moderate to high archaeological potential

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

The financial comparison between the remaining alternatives of ILI and PRS for the Trail Lateral 168 is shown in the table below. PLE, HSTP and PLR were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost, lowest PV of incremental revenue requirement and lowest levelized rate impact.

	ILI	PRS
AACE Estimate Class	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	18,212	5,399
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,740	1,281
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	845	18
PV of Incremental Revenue Requirement - 66 years ($000s)	19,043	5,915
Levelized Rate Impact - 66 years (%)	0.14%	0.04%

The table below shows the scoring of ILI and PRS for each of the three criteria, and the overall weighted score:

	ILI	PRS
Integrity and Asset Management Capabilities	4.8	2.9
Project Execution & Lifecycle Operation	3.1	3.8
Financial	1.0	5.0
Overal Score	**3.1**	**3.8**

FEI recommends PRS as the preferred alternative for the Trail Lateral 168 and will be installed at the Trail lateral tap.

ILI was not recommended for this lateral due to the incremental cost and challenging construction terrain, which resulted in the lower overall scores for these alternatives.

1.1.22 Fording Lateral 219/168

The Fording Lateral begins east of Corbin Road and south of the Crowsnest Highway in Sparwood, home to approximately 3,500 residents. The lateral traverses north and heads through Elkford and ends at the Fording River Coal mine. The municipality of Elkford is home to approximately 2,500 residents. This lateral is significant because of downstream laterals and several large mining customers throughout including Elkview Coal, Line Creek Mine, Fording Greenhills Mine and Fording River Coal.

Length of Pipeline (kilometres)		79.6
Outside Diameter(s) (millimetres)		219/168
Year of Construction		1971
ROW Width (metres)		10-15
Number of Customers	**Residential**	3,932
	Commercial	379
	Industrial	15
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Steep terrain, pipe in valley bottom • Area known for washouts • Access issues between Sparwood and Line Creek Lateral • Lateral goes through edge of tailings pond • Highway and railway crossings Property: • Teck property, historically challenging to work on Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Conservation area between Sparwood and Line Creek lateral • Ungulate winter range 4-006 • Proximity to rivers and river crossings • Stream and wetland crossings • Species at risk occurrences, including 4 plant species at risk • Osprey nest nearby • Registered contaminated sites Archaeological: • Archaeological sites nearby • Area heavily disturbed by mining, may be hard to determine archaeology

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Fording Lateral 168/219 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Fording Lateral 168/219 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	93,666
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	4,485
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	6,178
PV of Incremental Revenue Requirement - 66 years ($000s)	102,288
Levelized Rate Impact - 66 years (%)	0.74%

ILI at this lateral will require a 219 millimetre control valve assembly and a 219 millimetre launcher assembly at the start of the Fording 219 Lateral. At the site where the Fording lateral reduces down to 168 millimetres in outer diameter at the 49 kilometre post (KP), there will be a 219 millimetre receiver assembly and a 168 millimetre launcher assembly. Lastly, there will be a 168 millimetre receiver assembly at the Fording River Coal Mine Station where the lateral terminates.

1.1.23 Elkview Lateral 168

The Elkview Lateral branches off of the Fording Lateral right at the intersection of Michel Creek Road and Industrial 2 Road. From there, the lateral heads north and ends at 1.6 kilometres where it serves Elkview Coal Mine.

Length of Pipeline (kilometres)		1.6
Outside Diameter(s) (millimetres)		168
Year of Construction		1970
ROW Width (metres)		9-12
Number of Customers	**Residential**	N/A
	Commercial	N/A
	Industrial	N/A
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Next to active coal mine plant

	Property: • Teck property Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • American badger occurrences • Ungulate winter range 4-006 • One stream crossing • Osprey nest Archaeological: • Pipeline crosses archaeological site • Moderate to high archaeological potential

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

The financial comparison between the remaining alternatives of ILI, PLR and PRS for the Elkview Lateral 168 is shown in the table below. PLE and HSTP were screened out as discussed in Section 4.4.4 and 4.4.5 of the Application. PRS is a feasible alternative for this lateral; after regulating the operating pressure of the lateral to 29.9 percent SMYS, there is still substantial capacity in the pipeline to meet customer demands. PRS has the lowest project capital cost but is slightly more expensive than PLR in terms of PV of incremental revenue requirement and levelized rate impact due to the requirement of future sustainment capital and O&M for PRS.

	ILI	PLR	PRS
AACE Estimate Class	Class 3	Class 3	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	8,213	6,588	5,319
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,722	-	1,314
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	659	-	18
PV of Incremental Revenue Requirement - 66 years ($000s)	10,072	5,831	5,877
Levelized Rate Impact - 66 years (%)	0.07%	0.04%	0.04%

The table below shows the scoring of ILI, PLR, and PRS for each of the three criteria, and the overall weighted score:

	ILI	PLR	PRS
Integrity and Asset Management Capabilities	4.8	4.7	2.9
Project Execution & Lifecycle Operation	3.5	3.3	3.8
Financial	2.0	5.0	5.0
Overal Score	**3.6**	**4.5**	**3.8**

FEI recommends PRS as the preferred alternative for the Elkview Lateral 168 and will be installed at the Elkview lateral tap.

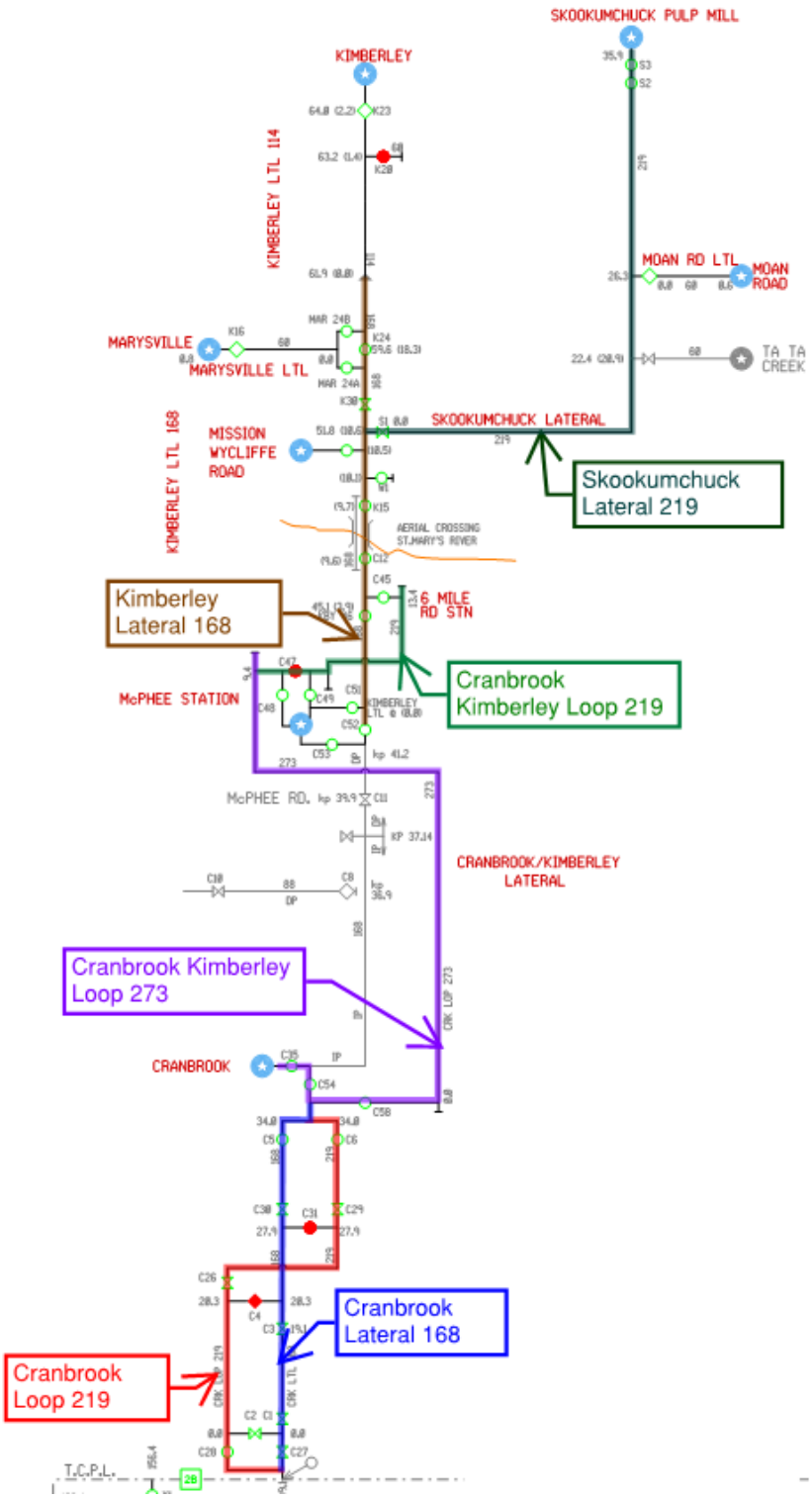
Despite PLR having a higher overall score, the incremental capital cost is significant and because PRS is feasible for this lateral, PLR is not recommended.

ILI is also not recommended for this lateral due to the incremental cost and challenging construction terrain, which resulted in the lower overall scores for these alternatives.

1.1.24 Cranbrook Lateral 168

The Cranbrook Lateral 168 begins near Gold Creek Road and Cavern Creek Road. The lateral follows Gold Creek Road to Cranbrook where it ends at 13 Street S and 26 Avenue S. Cranbrook is home to approximately 20,000 residents and makes up the largest urban centre in the Regional District of East Kootenay. The Cranbrook Kimberley system involves 6 different laterals (Cranbrook Loop 219 described in Section 1.1.25, Cranbrook Kimberley Loop 273 described in Section 1.1.26, Cranbrook Kimberley Loop 219 described in Section 1.1.27, Kimberley Lateral described in Section 1.1.28, and Skookumchuck Lateral described in Section 1.1.29) and, because they are all interconnected, they have been treated as one system and the evaluation of alternatives for all these laterals was done together. For clarity, the system diagram can be seen in the figure below.

Overview of Cranbrook Kimberley System



Length of Pipeline (kilometres)		34.0
Outside Diameter(s) (millimetres)		168
Year of Construction		1990
ROW Width (metres)		10
Number of Customers	**Residential**	12,986
	Commercial	1,187
	Industrial	21
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Many bends to replace if ILI is chosen Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Stream and wetland crossings • Proximity to sensitive riparian areas • Species at risk occurrences • Wildlife habitat areas 4-180 for Grizzly bear • Ungulate winter range 4-006 Archaeological: • Archaeological sites near the end of the lateral • Valley bottom has high potential archaeology

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Cranbrook Lateral 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.

The financial analysis of ILI for the Cranbrook Lateral 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	15,652
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	2,407
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	2,696
PV of Incremental Revenue Requirement - 66 years ($000s)	22,297
Levelized Rate Impact - 66 years (%)	0.16%

With ILI at this lateral, there will be a launcher and a control valve assembly at the start of the Cranbrook lateral, and a receiver assembly at the Cranbrook Gate Station where the lateral terminates.

1.1.25 Cranbrook Loop 219

The Cranbrook Loop 219 parallels the Cranbrook Lateral 168 from start to finish. It also begins near Gold Creek Road and Cavern Creek Road. The loop follows Gold Creek Road all the way to Cranbrook where it ends at 13 Street S and 26 Avenue S.

Length of Pipeline (kilometres)		34.0
Outside Diameter(s) (millimetres)		219
Year of Construction		1968
ROW Width (metres)		10
Number of Customers	**Residential**	12,986
	Commercial	1,187
	Industrial	21
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Many bends to replace if ILI is chosen Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Stream and wetland crossings • Proximity to sensitive riparian areas • Species at risk occurrences • Wildlife habitat areas 4-180 for Grizzly bear • Ungulate winter range 4-006 Archaeological: • Archaeological sites near the end of the lateral • Valley bottom has high potential archaeology

** Akisqnuk First Na`tion, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Cranbrook Loop 219 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Cranbrook Loop 219 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	13,584
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,715
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	3,861
PV of Incremental Revenue Requirement - 66 years ($000s)	20,527
Levelized Rate Impact - 66 years (%)	0.15%

With ILI at this lateral, there will be a launcher and a shared control valve assembly with the lateral at the start of the Cranbrook loop, and a receiver assembly at the Cranbrook Gate Station where the loop terminates.

1.1.26 Cranbrook Kimberley Loop 273

The Cranbrook Kimberley Loop 273 begins where the Cranbrook Lateral 168 and Cranbrook Loop 219 end. This segment continues north to where the Cranbrook Kimberley Loop 219 begins.

Length of Pipeline (kilometres)		9.4
Outside Diameter(s) (millimetres)		273
Year of Construction		1992
ROW Width (metres)		9-18
Number of Customers	**Residential**	4,291
	Commercial	280
	Industrial	4
Important Factors in Execution and Lifecycle Operation		Property: • Private properties • ROW width at tie in is 8m

	• Crosses through Mission Hill golf course Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Stream and wetland crossings • Proximity to sensitive riparian areas • Species at risk occurrences • Critical Habitat polygon for caribou • Ungulate winter range 4-006 • Registered contaminated site Archaeological: • Many archaeological sites • Three known archaeological sites on Mission Hills golf course

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Cranbrook Kimberley 273 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Cranbrook Kimberley Loop 273 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	7,932
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,357
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	1,031
PV of Incremental Revenue Requirement - 66 years ($000s)	10,722
Levelized Rate Impact - 66 years (%)	0.08%

With ILI at this lateral, there will be a launcher assembly at the start of the loop at Cranbrook Gate Station and a receiver assembly at McPhee Station where the loop terminates.

1.1.27 Cranbrook Kimberley Loop 219

The Cranbrook Kimberley Loop 219 begins where the Cranbrook Lateral 168 and Cranbrook Loop 219 end. This segment starts where the Cranbrook Loop 273 ends in McPhee Station and loops the initial 4 kilometres section of the Kimberley Lateral 168 where it ends at 6 Mile Road Station.

Length of Pipeline (kilometres)		4.0
Outside Diameter(s) (millimetres)		219
Year of Construction		1992
ROW Width (metres)		12
Number of Customers	**Residential**	4,291
	Commercial	280
	Industrial	4
Important Factors in Execution and Lifecycle Operation		Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Stream crossings • Heron Rookery • Species at risk occurrences • Critical habitat polygon for caribou • Ungulate winter range 4-006 Archaeological: • Moderate to high archaeological potential

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Cranbrook Kimberley Loop 219 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis for the Cranbrook Kimberley Loop 219 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	6,807
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,334
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	491
PV of Incremental Revenue Requirement - 66 years ($000s)	9,164
Levelized Rate Impact - 66 years (%)	0.07%

With ILI at this lateral, there will be a launcher assembly at the start of the loop at the McPhee Station and a receiver assembly at Six Mile Road Station where the loop terminates.

1.1.28 Kimberley Lateral 168

The Kimberley Lateral 168 begins at the same site where the Cranbrook Kimberley Loop 273 ends and the Cranbrook Kimberley Loop 219 begins. The Kimberley Lateral 168 follows the Northstar Rails to Trails road through Wycliffe and continues north where the 168 millimetre section ends in Ta Ta Creek. The lateral reduces to 114 millimetre and continues into the City of Kimberley, home to approximately 4500 residents.

Length of Pipeline (kilometres)		20.6
Outside Diameter(s) (millimetres)		168
Year of Construction		1962
ROW Width (metres)		10
Number of Customers	**Residential**	4,291
	Commercial	280
	Industrial	4
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Crosses St Mary River • Road and highway crossings Property: • Private properties • ROW width down to 10m in one section Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Steam crossings • Critical habitat polygons for caribou and

	woodpecker • St Mary River crossing • Species at risk occurrences • Registered contaminated sites Archaeological: • Moderate to high archaeological potential

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Kimberley Lateral 168 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis for the Kimberly Lateral 168 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	19,612
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,452
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	2,558
PV of Incremental Revenue Requirement - 66 years ($000s)	23,329
Levelized Rate Impact - 66 years (%)	0.17%

With ILI at this lateral, there will be a launcher assembly at the McPhee Station and a receiver assembly at Ta Ta Creek where the 168 millimetre section of Kimberley Lateral terminates and reduces to 114 millimetres in outer diameter.

1.1.29 Skookumchuck Lateral 219

The Skookumchuck Lateral begins just north of Mission Wycliffe Road and Mellor Road in Cranbrook. The Skookumchuck lateral heads north along Highway 95A and Highway 95 until it reaches Skookumchuck Pulp mill.

Length of Pipeline (kilometres)	35.9
Outside Diameter(s) (millimetres)	219
Year of Construction	1968

ROW Width (metres)		12
Number of Customers	**Residential**	75
	Commercial	1
	Industrial	1
Important Factors in Execution and Lifecycle Operation		Operational Complexity: • Railway crossing • Creek crossings Property: • Crown and private properties • ROW width down to 10m in one section Indigenous Community Consultation: • Shuswap Indian Band • Ktunaxa Nation Council* Environmental: • Stream and wetland crossings • Critical habitat polygons for caribou and woodpecker • Species at risk occurrences • Wildlife Habitat Area 4-117 for antelope brush/ bluebunch wheatgrass plant community • Wildlife Habitat Areas 4-089 and 4-091 for American Badger • Wildlife Habitat Area 4-068 for Long-billed Curlew • Ungulate Winter Ranges 4-008 and 4-006 • Important Bird Area Skookumchuck Prairie • Registered contaminated site Archaeological: • Archaeological site near TaTa Creek • Moderate to high archaeological potential

** Akisqnuk First Nation, Lower Kootenay Band, St. Mary's Indian Band, Tobacco Plains Indian Band are collectively notified through Ktunaxa Nation Council.*

FEI recommends ILI as the preferred alternative for the Skookumchuck Lateral 219 since all other alternatives were previously screened out as discussed in Section 4.4.4 and 4.4.5 of the Application: PLE was not feasible due to complex project execution as a result of the need to excavate the entire length of the lateral; HSTP was not feasible as there is no practical means to support downstream customers when the lateral is shut down for the work; PRS was screened out as it is not feasible due to capacity limitations; and PLR was screened out as it is cost prohibitive at a high level estimate compared to other feasible alternatives.The financial analysis of ILI for the Skookumchuck Lateral 219 is shown in the table below.

	ILI
AACE Estimate Class	Class 3
Total Project Capital Costs, As-Spent, incl. AFUDC & Removal ($000s)	7,942
PV of Post-Project Incremental Sustainment Capital - 66 years ($000s)	1,646
PV of Post-Project Incremental Sustainment O&M - 66 years ($000s)	3,825
PV of Incremental Revenue Requirement - 66 years ($000s)	13,794
Levelized Rate Impact - 66 years (%)	0.10%

With ILI at this lateral, there will be a launcher assembly at the start of the Skookumchuck lateral where it ties into the Kimberley lateral, and a receiver assembly at the Skookumchuck Pulp Mill station at the end of the lateral.

Appendix B

LATERALS FEED BY SUPPLIER

1. INLAND GAS UPGRADES LATERALS

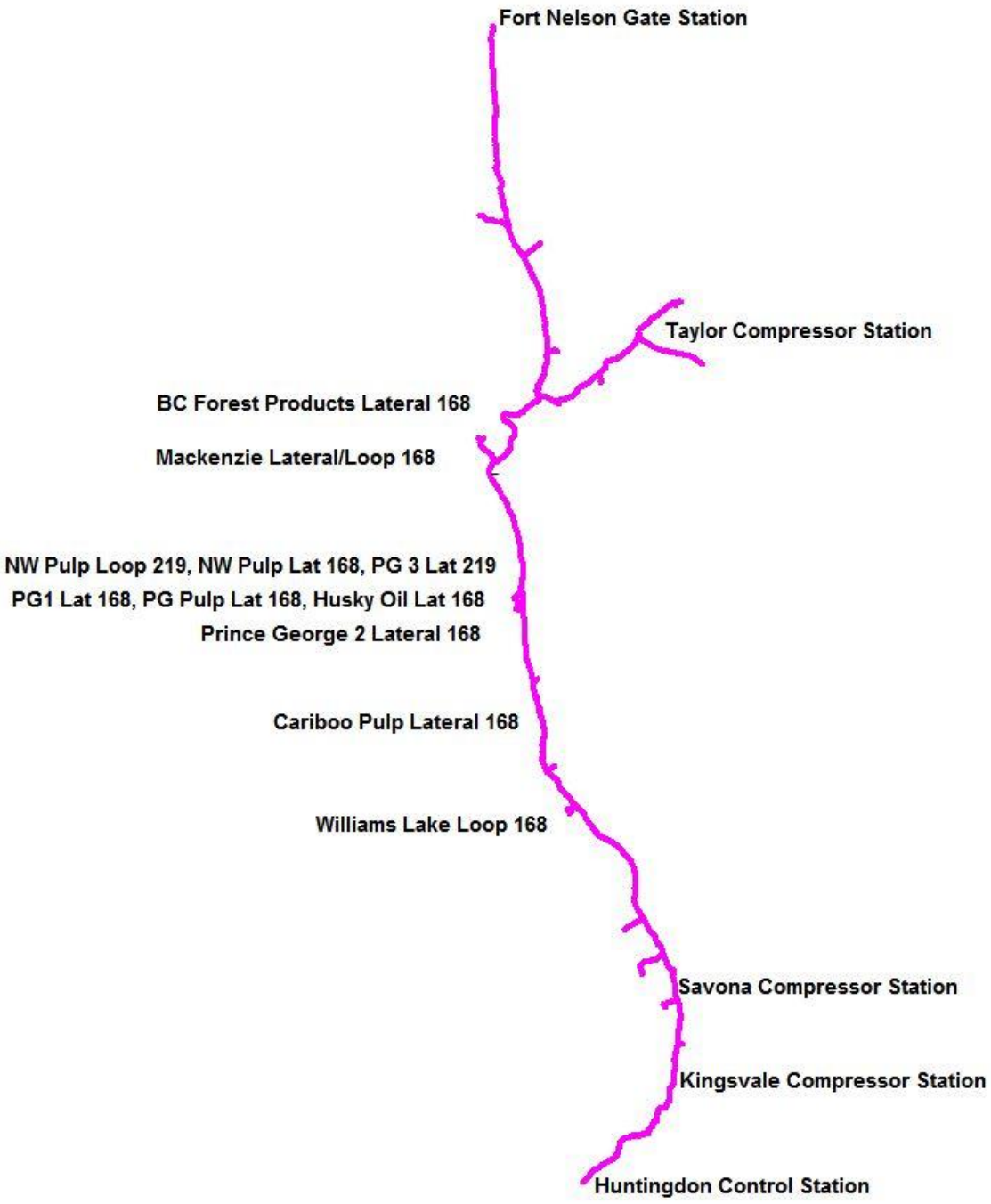
The laterals that are in the scope of the project are supplied by three systems, Enbridge, TransCanada Pipeline and FEI's Interior Transmission System (ITS).

1.1 *ENBRIDGE LATERALS*

The Enbridge mainline runs north to south through the province and supplies the following laterals:

- Mackenzie Lateral 168
- Mackenzie Loop 168
- BC Forest Products Lateral 168
- Cariboo Pulp Lateral 168
- Northwood Pulp Lateral 168
- Northwood Pulp Loop 219
- Prince George 3 Lateral 219
- Prince George 1 Lateral 168
- Prince George Pulp Lateral 168
- Husky Oil Lateral 168
- Prince George 2 Lateral 168/219
- Williams Lake Loop 168

Figure B-1: FEI laterals supplied by Enbridge



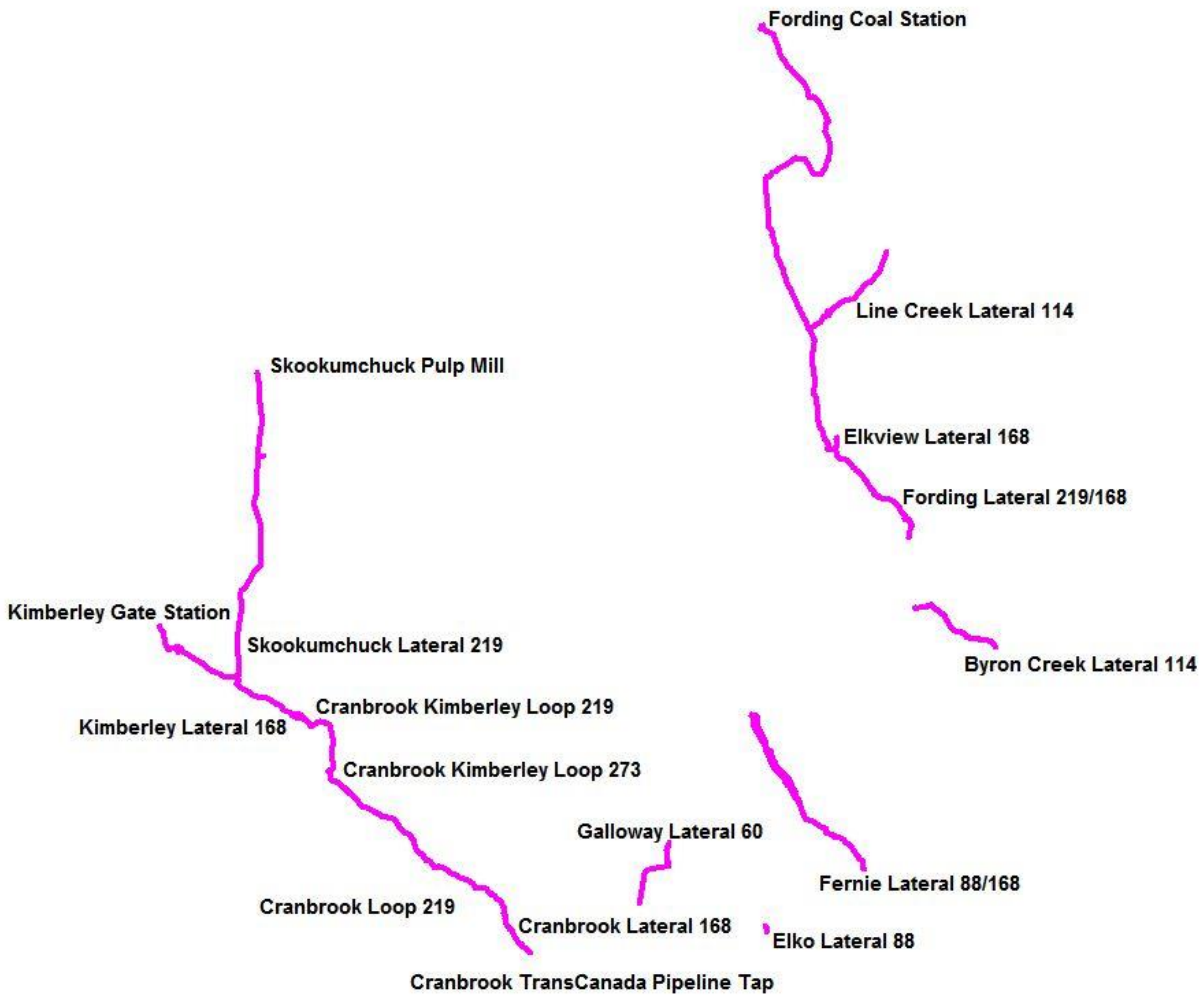
1.2 *TRANSCANADA PIPELINE LATERALS*

The laterals supplied by the TransCanada pipeline are as follows:

- Fording Lateral 219/168

- Elkview Lateral 168
- Cranbrook Lateral 168
- Cranbrook Loop 219
- Cranbrook Kimberley Loop 273
- Cranbrook Kimberley Loop 219
- Kimberley Lateral 168
- Skookumchuck Lateral 168

Figure B-2: FEI laterals supplied by TransCanada pipeline

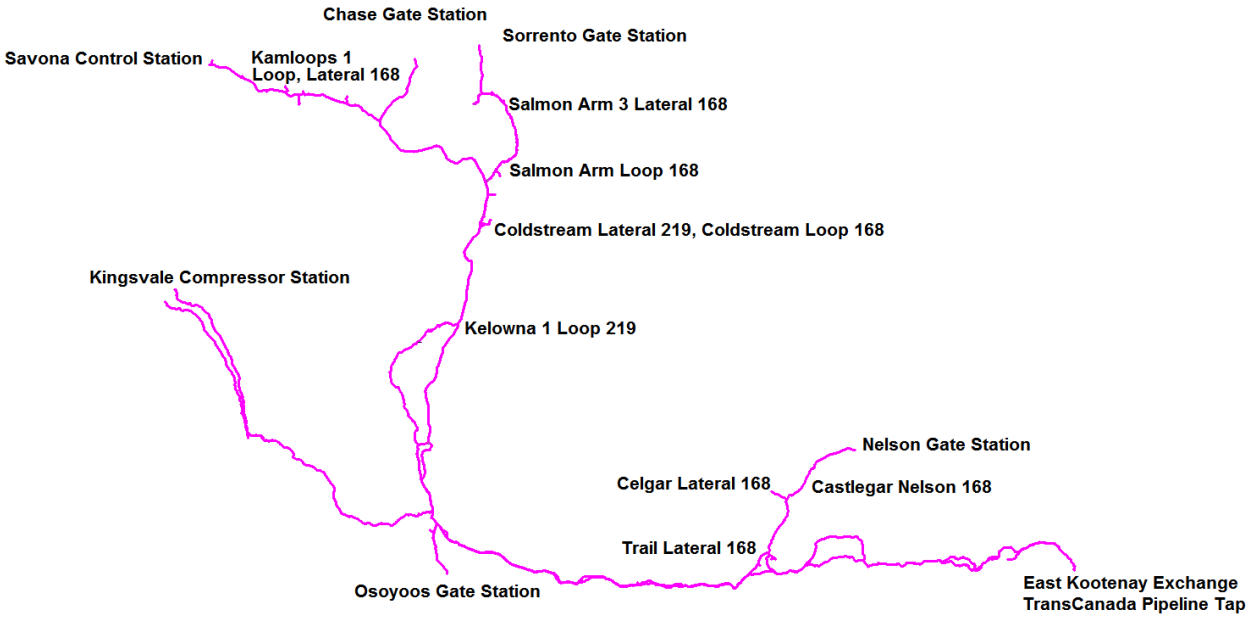


1.3 *FEI'S INTERIOR TRANSMISSION SYSTEM LATERALS*

FEI has a mainline system that bridges between the Enbridge system and the TransCanada pipeline system. This mainline system is called the Interior Transmission System (ITS). The laterals supplied by the ITS are:

- Trail Lateral 168
- Celgar Lateral 168
- Castlegar Nelson 168
- Kelowna 1 Loop 219
- Coldstream Loop 168
- Coldstream Lateral 219
- Salmon Arm Loop 168
- Salmon Arm 3 Lateral 168
- Kamloops 1 Lateral/Loop 168

Figure B-3: FEI laterals supplied by Interior Transmission System



Appendix C

PIPELINE PERFORMANCE SUMMARY
2016 ANNUAL REPORT

Pipeline Performance Summary

BC Oil & Gas COMMISSION

2016 Annual Report

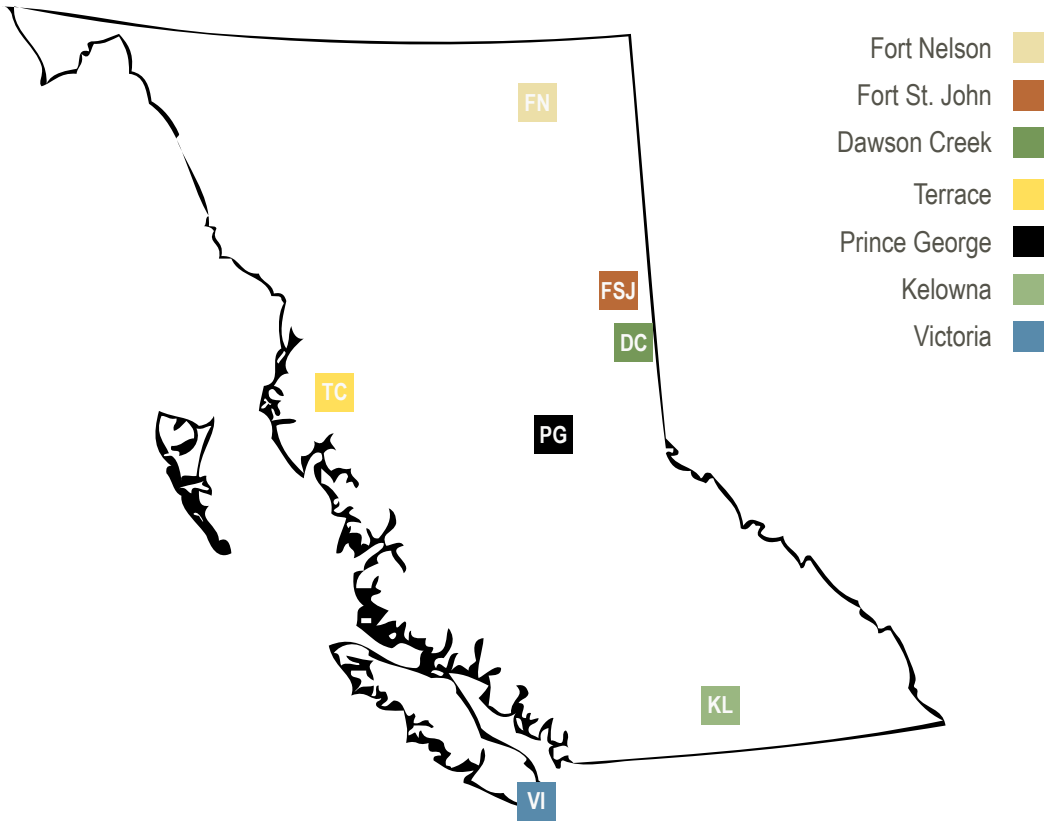
Role of the

BC OIL AND GAS COMMISSION

The BC Oil and Gas Commission (Commission) is the provincial regulatory agency with responsibilities for regulating oil and gas activities in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core services include reviewing and assessing applications for industry activity, consulting with First Nations, cooperating with partner agencies, and ensuring industry complies with provincial legislation and all regulatory requirements. The public interest is protected by ensuring public safety, respecting those affected by oil and gas activities, conserving the environment, and ensuring equitable participation in production.

For general information about the Commission, please visit www.bcogc.ca or phone 250-794-5200.



The Commission's workforce consists of 250 employees operating out of seven locations - Fort Nelson, Fort St. John, Dawson Creek, Terrace, Prince George, Kelowna and Victoria, with the largest number of employees concentrated in Fort St. John, the heart of oil and gas activity in the province. The offices in Fort Nelson and Dawson Creek ensure the Commission's presence in the communities of the Horn River Basin and Montney gas plays respectively.

OUR VISION

To provide oil and gas regulatory excellence for British Columbia's changing energy future.

OUR MISSION

We regulate oil and gas activities for the benefit of British Columbians.

We achieve this by:

- Protecting public safety,
- Respecting those affected by oil and gas activities,
- Conserving the environment, and
- Supporting resource development.

Through the active engagement of our stakeholders and partners, we provide fair and timely decisions within our regulatory framework.

We support opportunities for employee growth, recognize individual and group contributions, demonstrate accountability at all levels, and instill pride and confidence in our organization.

We serve with a passion for excellence.

OUR VALUES

Respectful	Accountable
Effective	Efficient
Responsive	Transparent

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INTRODUCTION

PURPOSE OF REPORT

British Columbia's oil and gas industry depends on pipelines for the distribution of products such as natural gas, water and oil. Pipelines are recognized as a safe and economical mode of transportation, and secure operation is essential to protecting public safety and the environment.

This report provides a statistical overview of pipelines regulated by the Commission in the 2016 calendar year. It includes data on types of pipelines, lengths, uses and overall pipeline incident rates. The multi-stage lifecycle of a pipeline is explained, and incident response protocols are outlined. It also summarizes the Integrity Management Program, a documented framework outlining the practices by which operators test and maintain pipelines to mitigate potential integrity issues.

Previous annual pipeline performance summaries can be found on the Commission's website at https://www.bcogc.ca/publications/Reports.

PIPELINE REGULATION

The Commission's jurisdiction extends to the majority of pipelines in British Columbia, as defined in legislation by the Oil and Gas Activities Act (OGAA). Activities regulated by the Commission extend throughout the lifecycle of a pipeline, and include pre-activity consultation and notification, permitting, construction, operation, maintenance and abandonment. Pipelines not under the Commission's jurisdiction include those crossing provincial and/or national borders and gas utility pipelines, are not addressed in this report.

Pipelines are regulated under the Pipeline Regulation, which states they must be operated and maintained in accordance with CSA Z662 – Oil and Gas Pipeline Systems. CSA Z662 is a national standard developed and maintained by the Canadian Standards Association (CSA) and covers the design, construction, operation and maintenance of oil and gas industry pipeline systems.

It is required that operators comply with other applicable regulations including the Environmental Protection and Management Regulation, Consultation and Notification Regulation, Pipeline Crossings Regulation, and Emergency Management Regulation.

The Commission is additionally responsible for provincial authorizations involving the Land Act, Water Sustainability Act, and the Forest Act for pipeline right-of-ways, roads, land clearing and other minor works.

The Legislation page of the Commission website provides the full list of acts and regulations governing oil and gas activities in the province.

PIPELINE INVENTORY

44,552 KILOMETRES

The Commission's annual Oil and Gas Reserves and Production reports have shown an upward trend in production year-over-year, with gas production almost doubling since 2010. This upturn contributes to increased pipeline capacity requirements and a gradual rise in the total number of pipelines.

The Commission currently regulates 44,552 kilometres (km) of pipelines in British Columbia. Pipelines transport a number of refined and unrefined products including natural gas, sour natural gas, liquid hydrocarbons (such as crude oil and high vapour pressure hydrocarbons), water and other miscellaneous gases. Eighty per cent of the pipelines regulated by the Commission transport natural gas, while approximately 10 per cent carry liquid hydrocarbons. The remainder carry water or other gases or liquids. Pipeline definitions and product classifications are available on page 14.

As shown in Table 1, the total length of pipelines in the province in 2016 was 44,552 km. This is a net addition of 968 km of total registered pipelines (starting operation or reactivated) over the previous year. Deactivated pipelines increased by 690 km while abandoned pipelines increased by 230 km. Operating pipelines in 2016 only slightly increased by 48 km.

TABLE 1: TOTAL LENGTHS OF PIPELINES BY TYPE AND STATUS (IN KILOMETRES)

TYPE	TOTAL	OPERATING	DEACTIVATED	ABANDONED
Natural Gas	21,773	19,843	1,162	768
Sour Natural Gas	14,062	12,103	1,595	364
Water	3,557	3,177	198	182
Liquid Hydrocarbons	4,816	3,953	577	286
***Other**	344	287	47	10
2016 GRAND TOTAL	**44,552**	**39,363**	**3,579**	**1,610**
*'Other' category shows lower 2016 totals due to reclassification of some product types into 'Liquid Hydrocarbons' category.				
Natural Gas	21,117	19,503	959	655
Sour Natural Gas	13,997	12,440	1,240	317
Water	3,450	3,146	138	166
Liquid Hydrocarbons	2,876	2,404	320	150
Other	2,143	1,821	231	92
2015 GRAND TOTAL	**43,584**	**39,315**	**2,889**	**1,380**
Natural Gas	20,865	19,564	703	598
Sour Natural Gas	13,739	12,715	763	261
Water	3,205	3,000	61	144
****Crude Oil**	2,336	2,073	168	95
****HVP**	358	302	10	46
Other	2,178	1,927	71	180
2014 GRAND TOTAL	**42,681**	**39,581**	**1,776**	**1,324**
**Crude Oil and high vapour pressure (HVP) categories combined into Liquid Hydrocarbon category post 2014.				

PIPELINE LIFECYCLE

MULTI-STAGE PLANNING

From the creation of a preliminary pipeline plan, through construction and inspections, to deactivation and abandonment, the lifecycle provided here depicts the multiple stages of a typical pipeline from initial land surveys to final site restoration.

At the outset, Commission decision makers conduct a comprehensive review of each pipeline application for engineering standards, legal requirements, and for environmental and public safety considerations. The Commission ensures proponents have conducted consultations with land owners and other rights holders on pipeline projects that will directly affect them, including the legal obligation to consult and accommodate First Nations.

If a pipeline application is approved, Commission specialists may set permit conditions as necessary to protect key environmental assets, such as water, wildlife and forest values. A significant component of the Commission's framework for managing the impacts of oil and gas development on the environment is Area-based Analysis, described on the Commission website.

The Commission then monitors the project throughout its lifecycle, confirming thorough inspections are performed, and equipment and operations are regularly tested. Should any deficiencies be identified at a site, the Commission may order the operator to cease activities as necessary until appropriate actions are performed to safely resume operations.

As detailed in the Commission's mandate, and considering the many stages of a pipeline's lifecycle, the protection of public safety is top priority. Permit holders are required to report to the Commission before, during and upon completion of their oil and gas activities. The framework under which pipelines are operated includes such initiatives as the pipeline Integrity Management Program (IMP), designed to help prevent spills before they happen. IMPs are described on page 8.

LAND SURVEY. Land and airspace are measured to establish property boundaries, topograhpy, and land features, and to develop surface maps.

PIPELINE PLAN. A preliminary pipeline plan is prepared, utilizing survey data to propose a safe, informed and responsible pipeline route.

CONSULTATION AND NOTIFICATION. Stakeholder engagement begins; the Commission is accountable for ensuring consultation is appropriate and adequate.

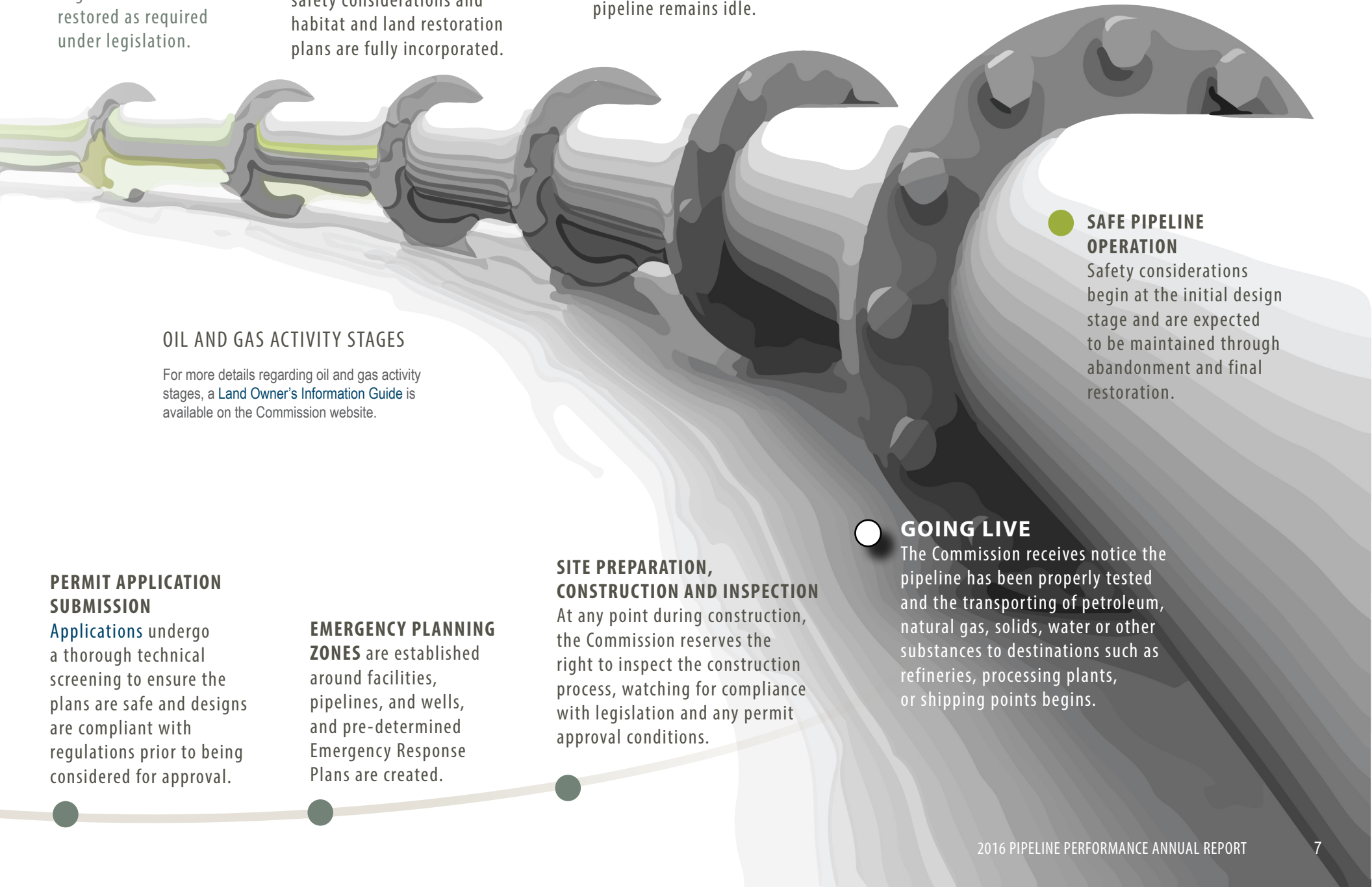
SITE ASSESSMENT. Pipeline route is determined, taking into account such matters as soil handling and conservation, aquifer protection, archaeological sites, and eventual site restoration considerations.

REMEDIATION
Soil stability, productivity and vegetation are restored as required under legislation.

DECOMMISSIONING
The Commission reviews abandonment (removal from service) requests to ensure safety considerations and habitat and land restoration plans are fully incorporated.

DEACTIVATION
The Commission evaluates deactivation requests for appropriate maintenance and monitoring measures, to prevent or minimize adverse effects while the pipeline remains idle.

INTEGRITY MANAGEMENT PROGRAM REVIEW
During the operating life of the pipeline, the Commission will review a company's IMP and any incidents and repairs that occur.



OIL AND GAS ACTIVITY STAGES

For more details regarding oil and gas activity stages, a Land Owner's Information Guide is available on the Commission website.

SAFE PIPELINE OPERATION
Safety considerations begin at the initial design stage and are expected to be maintained through abandonment and final restoration.

GOING LIVE
The Commission receives notice the pipeline has been properly tested and the transporting of petroleum, natural gas, solids, water or other substances to destinations such as refineries, processing plants, or shipping points begins.

SITE PREPARATION, CONSTRUCTION AND INSPECTION
At any point during construction, the Commission reserves the right to inspect the construction process, watching for compliance with legislation and any permit approval conditions.

EMERGENCY PLANNING ZONES are established around facilities, pipelines, and wells, and pre-determined Emergency Response Plans are created.

PERMIT APPLICATION SUBMISSION
Applications undergo a thorough technical screening to ensure the plans are safe and designs are compliant with regulations prior to being considered for approval.

INTEGRITY MANAGEMENT PROGRAM

COMPLIANCE ASSURANCE

To prevent and reduce pipeline incidents, the Pipeline Regulation requires all pipeline operators in the province implement an Integrity Management Program (IMP). Pipeline IMPs are documented programs specifying the processes and practices used by pipeline operators to ensure public safety, environmental protection, and operational reliability. The IMP programs incorporate a management system approach.

As per the B.C. Pipeline Regulation (PR), Section 7, every pipeline permit holder planning, designing, constructing, operating, maintaining or abandoning pipeline infrastructure within the province must have developed and implemented IMPs. Compliance protocols are available to operators, outlining Commission expectations and operating requirements, and guiding them in developing, implementing and maintaining effective IMPs.

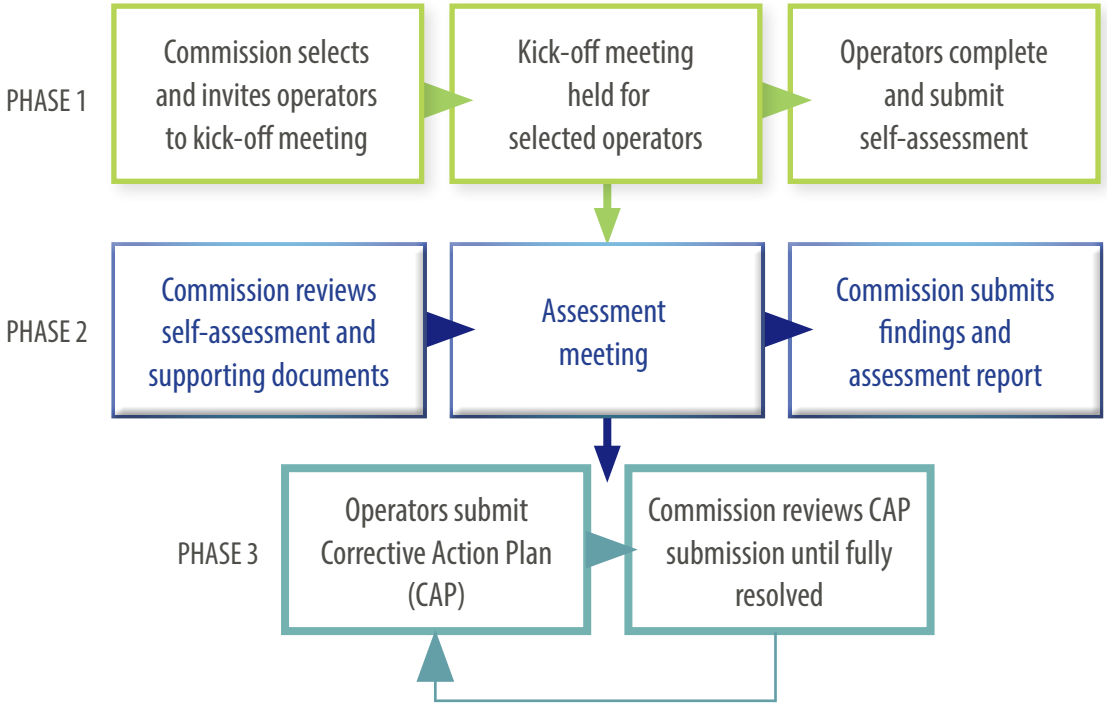
The Commission has been assessing the effectiveness of permit holders' IMP programs since 2011. The pipeline IMP compliance assurance process consists of three phases (Figure 1). The first phase is a self-assessment, completed by the operator and submitted to the Commission. The second phase consists of an assessment meeting, where findings from the pipeline IMP assessment are reviewed face-to-face with the permit holder, with subsequent meetings arranged as necessary. The third phase allows for corrective action plans and follow ups. Details of the compliance assurance process and the scope of the protocol can be viewed on the Commission website.

During 2016, the Commission assessed the IMP programs of 19 pipeline operators. Where non-compliances were identified, operators were required to develop and implement corrective actions to rectify the deficiencies.

The Commission monitors and assesses all corrective actions to ensure all non-compliance is fully resolved.

The Commission will continue to undertake IMP compliance assessments for all B.C. pipeline operators, engaging with companies to improve the design, construction, operation and maintenance of pipelines, including older, legacy pipes.

FIGURE 1:
COMPLIANCE ASSURANCE PROCESS - PIPELINE INTEGRITY MANAGEMENT PROGRAM



PIPELINE INCIDENTS

AND EMERGENCY RESPONSE PROGRAMS

To coordinate and prepare for incidents in advance, permit holders must develop and maintain emergency response programs and response contingency plans (ERPs), as directed in the Emergency Management Regulation (EMR).

Emergency response programs guide the creation, management and implementation of a permit holder's ERPs, allowing for quick access to critical information, coordination of multiple-responder activities, and identification of predetermined equipment and services available for deployment in an emergency. They equip incident responders with hands-on training and emergency response exercises, ensuring personnel understand their incident command structure, communication methods, and responsibilities in an emergency event.

The Commission's Security and Emergency Management Branch regularly audits ERPs to ensure consistent compliance with the EMR, and oversees and may participate in permit holder emergency response exercises. Should a permit holder's emergency protocols fail to meet requirements, the Commission may utilize compliance and enforcement actions, which may include issuing orders, penalties, or shutting-in a pipeline system.

The requirements in the EMR are designed to create a framework for the protection of the public, emergency responders, property and the environment from incidents occurring due to oil and gas activities. Although emergency preparation, equipment and protocols help reduce the rate of incidents, the Commission strives to continually improve emergency management measures.

2016 INCIDENTS

In 2016 there were 26 incidents on pipelines regulated by the Commission[1], however not all led to the release of a product. Table 2 shows an overall incident frequency of 0.58 for every 1,000 km of pipelines, a significant decrease from 1.03 in 2015.

As stated, not all incidents result in a spill or release of a product. In 2010 the implementation of OGAA led to broader reporting criteria, meaning all incidents – including those that have the potential to affect the integrity of a pipeline but did not cause spillage – must be reported.

Additional information regarding emergency response and management, including guidelines and forms, is available on the Commission's Emergency Response and Safety webpage.

The Emergency Management Regulation outlines several requirements for creating an emergency response plan framework, establishing a comprehensive approach that addresses prevention, mitigation, preparedness, response, and recovery components.

TABLE 2: TOTAL NUMBER OF INCIDENTS PER 1,000 KM OF PIPELINE INVENTORY

	2012	2013	2014	2015	2016
LENGTH OF PIPELINES (KM)	40,125	40,392	42,681	43,584	44,552
NUMBER OF INCIDENTS	27	38	42	45	26
INCIDENT FREQUENCY (PER/1,000 KM)	0.67	0.94	0.98	1.03	0.58

1. These incidents apply only to events on operating pipelines. Incidents that occur prior to a line going active (such as during construction or pressure testing) and some near misses have not been included. There were 25 incidents related to construction in 2016.

INCIDENT RESPONSE

AND ENFORCEMENT ACTIONS

An incident is defined as a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency. Operators must communicate all reportable incidents to the Commission. Non-minor incidents must be reported immediately (within 1 hour), and minor incidents must be reported within 24 hours. The Commission's Incident Classification Matrix outlines spill reporting criteria, and how incident levels are assessed, determined and reported.

Any person aware spillage is occurring, or believes there is the potential for spillage, can provide assistance by calling the operating company indicated on the signage and identifying the location of the pipeline, or by calling the Commission's 24/7 emergency number at 1-800-663-3456.

The Commission responds to all incidents, establishing communication with the operator, confirming the incident level, and assessing the operator's response. Commission staff further determine what remedial actions must be taken, whether a pipeline can continue to operate safely, and whether compliance or enforcement actions are required.

Subsequent incident investigations allow the Commission to confirm the cause and any contributing factors, and whether repairs or solutions should be broadly communicated to all other operators to prevent similar incidents from occuring. Inspections may also be triggered by public enquiries and incidents reported to the Commission.

When required, Orders, tickets and/or penalties are issued to the operator. The Commission is committed to publishing its enforcement actions on its website in a timely and transparent manner by way of its Compliance and Enforcement page, and through quarterly enforcement action summary publications.

ORDERS - issued if an operator fails to comply with OGAA, associated regulations, permits or authorizations, a previous Order, or to deal with issues of public safety or protection of the environment.

TICKETS - issued under the authority of provincial acts, including the Water Sustainability Act.

ADMINISTRATIVE PENALTIES - levied in the event of a contravention of OGAA.

CHARGES - recommended to Crown counsel for prosecution and possible court conviction.

If an incident results in spillage, the following actions must be taken (Sec. 37, OGAA).

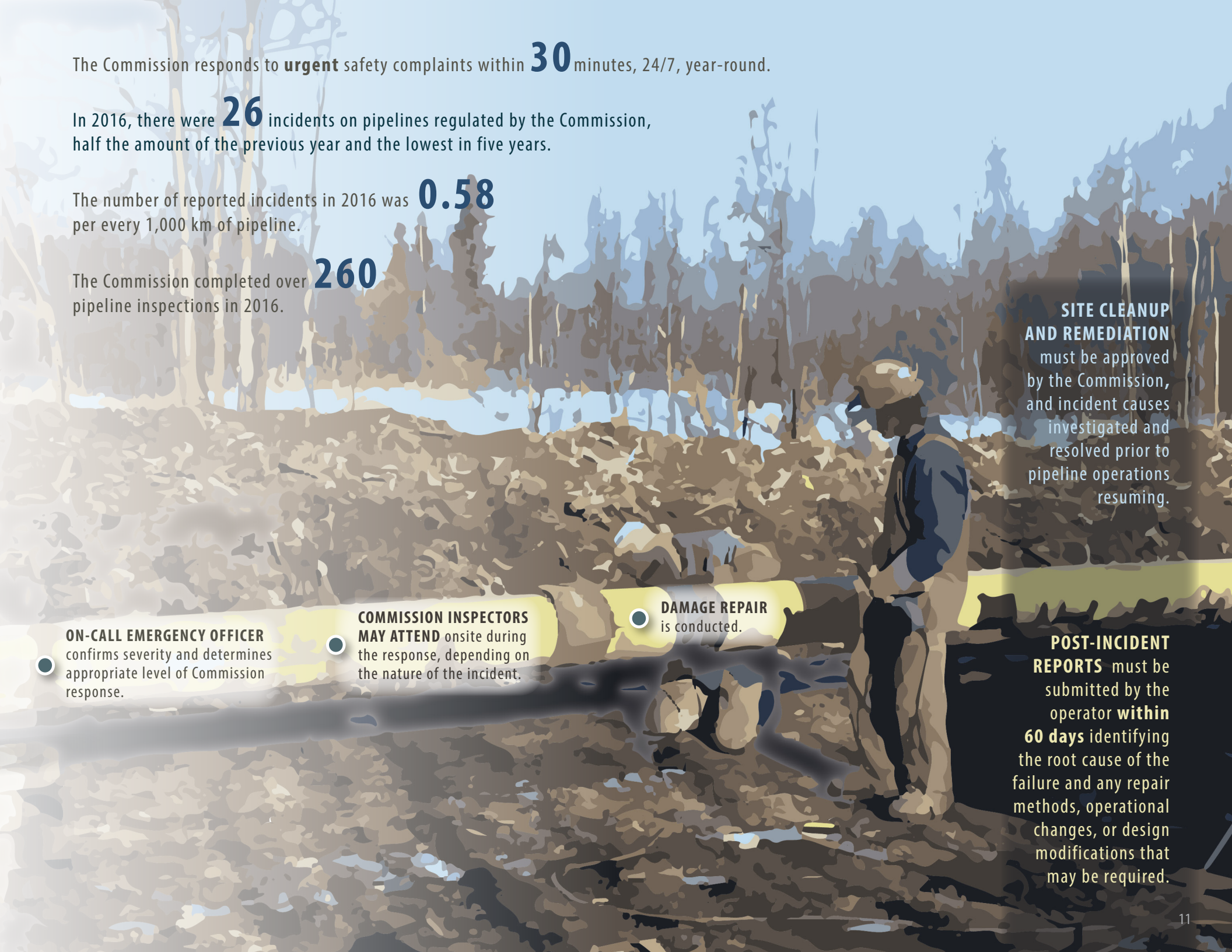
- **PREVENT** spillage.
- **PROMPTLY REPORT** any damage or malfunction that could cause spillage.
- **REMEDY** the cause or source of spillage if any occurs.
- **CONTAIN AND ELIMINATE** the spillage.
- **REMEDIATE** any affected land or body of water.
- **REPORT LOCATION AND SEVERITY** of spillage and any contributing damage or malfunction.

The Commission responds to **urgent** safety complaints within **30** minutes, 24/7, year-round.

In 2016, there were **26** incidents on pipelines regulated by the Commission, half the amount of the previous year and the lowest in five years.

The number of reported incidents in 2016 was **0.58** per every 1,000 km of pipeline.

The Commission completed over **260** pipeline inspections in 2016.



ON-CALL EMERGENCY OFFICER confirms severity and determines appropriate level of Commission response.

COMMISSION INSPECTORS MAY ATTEND onsite during the response, depending on the nature of the incident.

DAMAGE REPAIR is conducted.

SITE CLEANUP AND REMEDIATION must be approved by the Commission, and incident causes investigated and resolved prior to pipeline operations resuming.

POST-INCIDENT REPORTS must be submitted by the operator **within 60 days** identifying the root cause of the failure and any repair methods, operational changes, or design modifications that may be required.

RELEASES AND SPILLS

2016 STATISTICS

In terms of incidents that involved a release or spill, Table 3 shows sour natural gas pipelines had the lowest incident rate with a frequency of 0.21 per 1,000 kilometres. Pipelines conveying product labeled as 'Other' transport miscellaneous liquids or gases, and had one incident. This category can also include service liquids and gases such as water/methanol mix and inert nitrogen gas.

In the event of a pipeline gas release or liquid spill, the Commission ensures complete clean up and remediation by the company, and that all problems are fixed before operations resume.

The largest gas release from a pipeline in 2016 was a 17,800 m^3 release of dry, sweet gas in the city of Surrey. The cause of the incident was a landowner excavation that damaged a farm tap and caused the gas release. Controlled excavation and exposure of the primary service tee allowed for isolation of the flow of gas, and the damaged section was replaced with new pipe.

The largest liquid spill from a pipeline in 2016 was 250 m^3 of produced water in the Clarke Lake region south of Fort Nelson. The operator activated its emergency response plan and shut-in the pipeline. A full incident assessment was conducted. The cause of failure was found to be external corrosion. The spill was cleaned up and the ruptured pipe was replaced with new pipe. An internal, instrumented pipe inspection was performed on the entire pipeline.

INCIDENT CAUSES

Table 4 shows metal loss was the leading cause of pipeline incidents in 2016, contributing to 12 incidents. External interference was the second leading cause of failures contributing to seven incidents. The interactive web-based BCOGC Incident Map provides the location of pipeline incidents dating back to 2009. It includes data on pipeline spills, releases, and damage to active and discontinued pipelines, including the status of incidents.

MOVING FORWARD

With 2016 being a low year for activity levels, and industry activity expected to return to higher historical averages, the Commission's number one goal is the continued refinement of safety standards through enhanced preparedness, prevention, response, and partnerships.

As tools are developed and operationalized to elevate pipeline performance, spill preparedness and emergency response capabilities, lessons learned will continue to be shared across the Commission and with stakeholders and experts throughout industry to successfully meet the demands of a strong safety culture.

TYPE OF PIPELINE	# OF INCIDENTS WITH RELEASE	LENGTH OF PIPELINE (KM)	FREQUENCY (PER 1,000 KM)
SOUR NATURAL GAS	3	14,062	0.21
NATURAL GAS	7	21,773	0.32
LIQUID HYDROCARBONS	6	4,816	1.25
WATER	6	3,557	1.69
OTHER	1	344	2.91

TABLE 3: TOTAL NUMBER OF INCIDENTS WITH RELEASE PER 1,000 KM BY TYPE OF PIPELINE IN 2016

TABLE 4: CLASSIFICATION OF PIPELINE FAILURES

INCIDENT CAUSE	DEFINITION	2016	2015	2014	2013	2012	2011
METAL LOSS	Wall thickness reduction due, for example but not exclusively, to corrosion						
CORROSION METAL LOSS		**12**	**25**	**21**	**22**	**12**	**17**
PIPELINE/EQUIPMENT FAILURE							
CRACKING IN PIPE	Mechanically driven or environmentally assisted cracking of the pipe	1	0	3	0	1	0
PIPE FITTINGS/JOINT FAILURE	Failure in valve, weld, flange, etc.	3	1	0	4	4	6
MISCELLANEOUS EQUIPMENT	Failure in tank, compressor, etc.	0	4	0	0	1	0
TOTAL CRACKING		**4**	**5**	**3**	**4**	**6**	**6**
EXTERNAL INTERFERENCE	External activities causing damage to pipe						
THIRD PARTY INTERFERENCE	Interference by someone other than operating company or its employees/contractors	5	3	1	5	2	1
COMPANY	Interference by operating company or its employees/ contractors	2	4	8	4	1	5
VANDALISM	Interference caused willfully by someone through attempted theft of service fluid	0	0	0	0	0	0
TOTAL EXTERNAL INTERFERENCE		**7**	**7**	**9**	**9**	**3**	**6**
MATERIAL MANUFACTURING OR CONSTRUCTION	Defects in the fitting, construction or components	**1**	**1**	**1**	**2**	**0**	**2**
GEOTECHNICAL FAILURE	Loss of integrity due to geotechnical effect, for example, slope movement or weather	**1**	**2**	**8**	**1**	**4**	**2**
OTHER CAUSES							
IMPROPER OPERATION	Decision error made by operating company during service	1	5	0	0	2	1
OVERPRESSURE	Failure caused due to overpressure of pipe	0	0	0	0	0	0
TOTAL OTHER CAUSES		**1**	**0**	**0**	**0**	**2**	**1**
TOTAL INCIDENTS		**26**	**45**	**42**	**38**	**27**	**34**

PIPELINES DEFINED

PIPELINE: pipelines regulated by the Commission are defined in OGAA (except in Section 9) as piping through which any of the following is conveyed or transported:

- Petroleum or natural gas.
- Water produced in relation to the production of petroleum or natural gas or conveyed to or from a facility for disposal into a pool or storage reservoir.
- Solids.
- Substances prescribed under Section 133(2)(v) of the Petroleum and Natural Gas Act.
- Other prescribed substances.

The scope of the definition also includes installations and facilities associated with the piping, but does not include:

- Piping used to transmit natural gas at less than 700 kilopascals (kPa) to consumers by a gas utility as defined in the Gas Utility Act.
- A well head.
- Anything else that is prescribed.

ABANDONED PIPELINE: pipelines removed from service and not maintained for a later return to service.

DEACTIVATED PIPELINE: pipelines removed from service but maintained for a later return to service.

OPERATING PIPELINE: pipelines actively used for the transport of fluids related to oil and gas operations, and piping that has been suspended from service for less than 18 months but not formally deactivated.

PRODUCT CLASSIFICATIONS

CRUDE OIL: crude oil, sour crude and low-vapour-pressure hydrocarbons.

LIQUEFIED NATURAL GAS: natural gas in its liquid form, achieved through cooling. The cooling process can reduce the volume of gas by 600 times, allowing for efficient tranport. Includes sweet gas and fuel gas.

NATURAL GAS: includes natural gas, sweet gas, and fuel gas. Consisting mostly of methane, natural gas is a colourless, odourless, flammable gaseous hydrocarbon.

OTHER: miscellaneous gases and liquids, condensate and oil emulsion/effluent.

SOUR NATURAL GAS: natural gas with a hydrogen sulphide (H_2S) partial pressure greater than 0.3 kilopascals.

OTHER

HIGH-VAPOUR PRESSURE (HVP) HYDROCARBONS: examples include ethylene, propane, pentanes and liquid ethane. These products can quickly convert to gaseous form at atmospheric pressure.

INCIDENT: for the purposes of this report, a present or imminent event or circumstance, resulting from an oil and gas activity that is outside the scope of normal operations, and may or may not be an emergency.

LOW-VAPOUR PRESSURE (LVP) HYDROCARBONS: these products flow through pipelines in liquid or quasi-liquid form at a lower pressure than HVP hydrocarbons. Examples include oil, heavy oil, and synthetic oil.

m^3: a measure of volume - cubic metres; 1m x 1m x1m; 1,000 litres.

PIPELINE PERMIT: a permit that includes permission to construct, maintain, and operate a pipeline.

SHUT-IN: the isolation or closure of a well zone, a pipeline or a facility. For example, the temporary shut-in of a well allows for the analysis of such factors as a well's productive capacity, pressure, and permeability.

SPILL: as defined in OGAA; petroleum, natural gas, oil, solids or other substances escaping, leaking, or spilling from a pipeline, well, shot hole, flow line, or facility (or any source apparently associated with any of those substances).

WATER: freshwater, produced water, salt water and sour water.

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Appendix D

OGC INCIDENT CLASSIFICATION MATRIX

INCIDENT CLASSIFICATION MATRIX

Instructions: Start at the top and continue down until you check off any one box in both consequence and probability to determine the incident classification. *This matrix is required as an attachment upon submission of an incident through the Online Minor Incident Reporting System.*

TABLE 1. CONSEQUENCE RANKING

RANK	CONSEQUENCE (any one of the following)
4	☐Major on site equipment or infrastructure loss ☐Major act of violence, sabotage, or terrorism which impacts permit holder assets ☐Reportable liquid spill beyond site, uncontained and affecting environment ☐Gas release beyond site affecting public safety
3	☐Threats of violence, sabotage, or terrorism ☐Reportable liquid spill or gas release beyond site, potentially affecting public safety, environment, or property ☐HAZMAT worker exposure exceeding allowable ☐Major on site equipment failure
2	☐Major on site equipment damage ☐A security breach that has potential to impact people, property or the environment ☐Reportable liquid spill or gas release potentially or beyond site, not affecting public safety, environment, or property
1	☐Moderate on site equipment damage ☐A security breach that impacts oil and gas assets ☐Reportable liquid spill or gas release on location ☐**Occurrence of magnitude 4.0 or greater induced earthquake within 3 km of oil and gas operations or any earthquake which is felt on surface within a 3 km radius of oil and gas operations
0	☐No consequential impacts

**** For this consequence criteria, a probability score of 2 or higher must be used.**

TABLE 2. PROBABILITY RANKING

RANK	PROBABILITY (any one of the following)
4	☐Uncontrolled, with control unlikely in near term
3	☐Escalation possible; under or imminent control
2	☐Escalation unlikely; controlled or likely imminent control
1	☐Escalation highly unlikely; controlled or imminent control
0	☐Will not escalate; no hazard; no monitoring required

TABLE 3. INCIDENT RISK SCORE AND CLASSIFICATION

CONSEQUENCE _____+ PROBABILITY _____= RISK SCORE _____ (this must be completed)

RISK SCORE	ASSESSMENT RESULT
Minor (1-2)	**Notification Only;** permit holder must notify the Commission online within 24 hours using the Form A: Minor Incident Notification Form. In addition to Form A, spills must also be reported to EMBC.
Moderate (3-4)	**Level-1 Emergency;** immediate notification (call EMBC)
Major (5-6)	**Level-2 Emergency;** immediate notification (call EMBC)
Serious (7-8)	**Level-3 Emergency;** immediate notification (call EMBC)

SEE OVER

Updated: 08-Sept-2017
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SPILL REPORTING CRITERIA

Where the permit holder holds or maintains rights, the permit holder must report to the BC Oil and Gas Commission, all spills of materials as identified below:

- A spill or release of any amount of materials which impacts water ways
- Hydrocarbons; 100 litres where the hydrocarbon contains no toxic materials and does not impact water ways
- Produced/salt water; 200 litres where the fluid contains no toxic materials
- Fresh water; 10,000 litres
- Drilling or invert mud; 100 litres
- Sour Natural gas; 10Kg or 15 m3 by volume where operating pressure is >100 PSI
- Condensate; 100 litres
- Any fluid including hydrocarbons, drilling fluids, invert mud, effluent, emulsions, etc. which contain toxic substances; 25 litres

Please refer to the BC Environmental Management Act; Spill Reporting Regulation, Schedule "Reporting Levels for Certain Substances" for determining reportable spillage amounts of other substances:

OTHER REPORTABLE INCIDENTS

The Commission's Incident Risk Classification Matrix is designed to assist permit holders in determining which incidents must be reported. However, some incidents, which do occur, may not meet the criteria outlined in the Incident Classification Matrix but still require notification to the Commission as a minor notification. These include the following:

- Spills or release of hazardous substances which are not provincially regulated, such as radioactive substances;
- Major damage to oil and gas roads or road structures;
- Drilling kicks when any one of the following occur:
  - pit gain of 3 m^3 or greater
  - casing pressure 85% of MA
  - 50% out of hole when kicked
  - well taking fluid (LC)
  - associated spill
  - general situation deterioration, i.e. leaks, equipment failure, unable to circulate, etc
- Pipeline incidents, such as spills during construction phase, exposed pipe caused by flooding, pipeline over pressure, failure (without release) of any pressure control or ESD device during operations
- Security related issues which are relatively minor; such information may be required for tracking and monitoring purposes only

OGC Incident Classification Matrix

Consequence		Probability 4	Probability 3	Probability 2	Probability 1	Probability 0
		☐ Uncontrolled, with control unlikely in near term	☐ Escalation possible; under or imminent control	☐ Escalation unlikely; controlled or likely imminent control	☐ Escalation highly unlikely; controlled or imminent control	☐ Will not escalate; no hazard; no monitoring required
4	☐ Major on site equipment or infrastructure loss ☐ Major act of violence, sabotage, or terrorism which impacts permit holder assets ☐ Reportable liquid spill beyond site, uncontained and affecting environment ☐ Gas release beyond site affecting public safety	Level 3	Level 3	Level 2	Level 2	Level 1
3	☐ Threats of violence, sabotage, or terrorism ☐ Reportable liquid spill or gas release beyond site, potentially affecting public safety, environment, or property ☐ HAZMAT worker exposure exceeding allowable ☐ Major on site equipment failure	Level 3	Level 2	Level 2	Level 1	Level 1
2	☐ Major on site equipment damage ☐ A security breach that has potential to impact people, property or the environment ☐ Reportable liquid spill or gas release potentially or beyond site, not affecting public safety, environment, or property	Level 2	Level 2	Level 1	Level 1	Minor Notification Form
1	☐ Moderate on site equipment damage ☐ A security breach that impacts oil and gas assets ☐ Reportable liquid spill or gas release on location ☐ ** Occurrence of magnitude 4.0 or greater induced earthquake within 3 km of oil and gas operations or any earthquake which is felt on surface within a 3 km radius of oil and gas operations	Level 2	Level 1	Level 1	Minor Notification Form	Minor Notification Form
0	☐ No consequential impacts	Level 1	Level 1	Minor Notification Form	Minor Notification Form	No notification Required

**** For this consequence criteria, a probability score of 2 or higher must be used.**

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Appendix E

DETAILED DESCRIPTION OF ILI PROCESS

1. DETAILED DESCRIPTION OF IN-LINE INSPECTION (ILI) PROCESS

The nine steps that comprise an in-line inspection are as follows:

1. Retrofits;
2. Construction verification;
3. ILI tool selection;
4. Pipeline cleaning;
5. ILI tool runs;
6. Data analysis;
7. Digs and repairs;
8. ILI tool validation; and
9. Determination of ILI re-inspection interval.

An in-line inspection of a particular pipeline relies on all 9 steps; however, it is possible that steps 1 and 2 may not be required each time an ILI is undertaken.

1.1 *RETROFITS*

As described above, a pipeline not designed for ILI must be retrofitted to remove any obstructions that may impede ILI tool passage through a pipeline. An obstruction could cause the ILI tool to become stuck, result in damage to the ILI tool or could cause speed fluctuations that exceed tool specifications, resulting in subsequent degradation or loss of data. Retrofits may also be required over the lifecycle of the pipeline as tool lengths and other tool specifications change with time.

1.2 *CONSTRUCTION VERIFICATION*

Upon completion of a retrofit, it is necessary to verify that obstructions were removed. A gauge plate tool or simple caliper tool is used to identify any obstructions that may remain in a given pipeline. Verification is important because pipeline records may not contain adequate documentation of all possible obstructions or pipeline damage could have resulted in a pipeline obstruction.

1.3 *ILI TOOL SELECTION*

There are a number of types of inline inspection tools that can be used to detect a variety of pipeline imperfections. Tools currently utilized by FEI are as follows:

- High resolution magnetic flux leakage (MFL) metal loss tools capable of:
  - detecting and accurately sizing external and internal corrosion imperfections;
  - detecting and accurately sizing significant gouges;
  - identifying and sizing girth weld imperfections;
  - identifying corrosion growth (run to run comparison);
  - detection of existing mechanical damage and identifying new mechanical damage (run to run comparison); and
  - providing a log of welds, joint lengths and fitting types and locations;
- High resolution geometry tools capable of:
  - detecting and accurately sizing dents and ovalities including o'clock position; and
  - detecting and accurately sizing wrinkles and buckles;
- Inertial mapping tools (typically part of the MFL or geometry tool) capable of:
  - providing the centre line coordinates of the pipeline (GPS coordinates);
  - locating and accurately measuring bends (angle, radius and direction);
  - identifying pipe movement (run to run comparison); and
  - providing pipeline strain measurement.

High resolution MFL, high resolution geometry, and inertial mapping ILI technology is considered by FEI proven and commercially available for transmission pipelines with an outside diameter of NPS 6 or greater. It is foreseeable that tools for smaller pipelines may become available as the technology further develops.

FEI has also been monitoring the evolution of new ILI tools. Robotic ILI tools (i.e. self-propelled) are emerging in the marketplace as a possible and cost-effective tool for shorter pipeline segments. Potential feasible and cost effective applications for Robotic ILI are:

- Lower pressure pipelines or pipelines with insufficient flow to adequately propel a traditional ILI tool;
- Inspection of pipelines or pipeline segments where access is difficult or where the line could not be retrofitted to allow for ILI (e.g. below a water crossing or below an immovable structure); and
- Inspection of short pipeline segments where it may be more cost effective to run a Robotic ILI tool versus a traditional ILI tool.

Robotic ILI tool technology is still under development and is not considered by FEI proven and fully commercialized. As such, FEI has not accepted this alternative into its suite of adopted ILI tools at this time.

Crack detection ILI technology (commonly referred to as "EMAT tools", as the technology relies upon electro-magnetic acoustic transducers) is another ILI tool that is increasingly being adopted by Canadian gas transmission pipeline operators for the detection of cracks and crack-like imperfections. It is also becoming increasingly commercially available for use in a variety of pipeline diameters.

1.4 *PIPELINE CLEANING*

Cleaning runs are performed prior an ILI tool run to provide for a clean line prior to inspection. Sensors can be impacted by debris in the pipeline as well as any substance potentially adhering to the internal wall of the pipeline, which can result in a subsequent degradation or loss of data. Over decades of operation, it is common for the interior of pipelines to contain quantities of hydrocarbons and iron oxide.

1.5 *ILI TOOLS RUNS VENDORS AND FLOW REQUIREMENTS*

Contracts are established with approved vendors for the provision of ILI tools to a given pipeline site. Once on site, FEI operations personnel load the ILI tool into the pipeline. Coordination within FEI and with downstream customers is necessary to provide the appropriate pipeline flow rates required for a specific ILI tool. It is sometimes necessary to schedule an ILI during a particular time of year to ensure proper flow rate(s) in accordance with general customer usage patterns, or to work with a large industrial customer or customers to add to or subtract from their planned gas usage.

1.6 *DATA ANALYSIS*

Subsequent to an ILI run, FEI analyzes the ILI data to validate it and to identify sites where excavations (also referred as integrity digs) may be necessary for further investigation and/or remediation. Data analyses performed by FEI on the ILI data include:

- Data alignment (e.g. weld matching, overlay of population density information);
- Assessment of tool run success to identify any areas of data loss or data degradation;
- Comparisons to previously obtained ILI data;
- Comparisons of ILI data to previously recorded dig data, if applicable (not applicable to baseline inspections involving a new technology, or a first-time inspected pipeline);
- Clustering of potentially interacting metal loss imperfections;

- Estimation of corrosion growth over time;
- Estimation of curvature strain for reported dent imperfections;
- Consultation of other pipeline information, such as cathodic protection readings or the presence of other potential or identified hazards; and
- Estimation of a failure mode (i.e. leak or rupture) and failure pressure, if applicable, for reported imperfections.

1.7 *DIGS AND REPAIRS*

When analysis of the ILI data identifies sites where integrity digs are required, an integrity-driven dig is undertaken, including the following activities:

- Pipeline excavation;
- Pipeline preparation for inspection (e.g. coating removal and surface preparation);
- Detailed pipeline inspection and evaluation;
- Pipeline repair and/or recoat; and
- Pipeline re-burial and site rehabilitation.

Performing integrity digs allows FEI to:

- Inspect (and to repair if necessary) imperfections such as dent, metal loss and weld-related features reported through ILI, including;
    - Imperfections that have been reported through ILI as exceeding CSA Z662 pipeline defect criteria[1];
    - Imperfections that have been predicted as potentially exceeding CSA Z662 pipeline defect criteria (e.g. corrosion growth predictions over time, analysis of reported ILI data to reflect tool data accuracy considerations);
    - Imperfections that are considered to have an unacceptable probability of failure;
- Assess and validate the ILI tool performance; and
- Collect data to inform FEI's integrity management program.

[1] FEI does not have permission to reproduce large portion of the X662 standard, however it can be accessed publically through the CSA Public Access pilot that is available through the National Energy Board at the following link. https://www.neb-one.gc.ca/sftnvrnmnt/xtntc-eng.html

Digs are scheduled at various times following completion of an ILI tool run, and in some cases may be required on an immediate basis.

1.8 *ILI TOOL VALIDATION*

Various data elements recorded at dig sites are compared to ILI tool run data, to assess the degree of correlation and performance of the ILI tool run. The performance of an ILI tool run cannot be determined without validation of the data through digs. Due to factors such as pipe condition, consequences of failure, and the degree to which the tool run correlates to the dig data, it is typically necessary for the data analysis to be repeated following receipt of the dig data.

1.9 *DETERMINATION OF ILI RE-INSPECTION FREQUENCY*

ILI tool re-inspection typically occurs on a five to seven-year cycle, with consideration to factors including analysis of tool run data, validation results, efficiency/scheduling factors, and availability or new or improved inspection tools.

Appendix F

MARCH 5, 2014 NEB LETTER TO TRANSCANADA PIPELINES LTD.

National Energy Board
Office national de l'énergie

File OF-Surv-Inc-2014-33 01
5 March 2014

Mr. Russell K. Girling,
President and Chief Executive Officer
TransCanada PipeLines Limited
450 – 1st Street SW
Calgary, AB T2P 5H1
Facsimile 403-920-2200

Dear Mr. Girling:

Nova Gas Transmission Ltd. (NGTL)
Order SG-N081-001-2014

The National Energy Board (NEB or the Board) recently released its audit of TransCanada PipeLines Ltd.'s (TransCanada) integrity management program. In the audit, the Board noted potential safety concerns for pipelines, specifically in the NGTL system, that either have not or cannot be inspected using in-line tools. Since the conclusion of the NEB's information gathering component of the audit in August of 2013, there have been three ruptures and four leaks on TransCanada's NGTL system. Those lines that have been returned to service are currently operating under a 20% pressure restriction.

The Board is concerned by this recent trend of pipeline releases. In order to proactively promote public safety and protection of the environment, the Board orders TransCanada to reduce its maximum operating pressure on the unpiggable pipelines previously identified by TransCanada to have the highest risk. The Board's intention with these pressure reductions is to encourage the conditions necessary for the continued safe operation of this network of natural gas pipelines, while proactively reducing the risk of future ruptures.

The safe and secure operation of pipeline infrastructure is of paramount importance to the Board. The Board has issued **Safety Order SG-N081-001-2014** (Safety Order) for affected sections of the NGTL System pursuant to sections 12 and 48 of the *National Energy Board Act.* The Safety Order outlines the Board's precautionary measures and terms and conditions on which TransCanada may request a revision or lifting of the pressure restriction.

…/2

444 Seventh Avenue SW
Calgary, Alberta T2P 0X8

444, Septième Avenue S.-O.
Calgary (Alberta) T2P 0X8

Canada

Telephone/Téléphone : 403-292-4800
Facsimile/Télécopieur : 403-292-5503
http://www.neb-one.gc.ca
Telephone/Téléphone : 1-800-899-1265
Facsimile/Télécopieur : 1-877-288-8803

The attached Safety Order directs TransCanada to operate the affected pipelines in the NGTL system at 20% of the 90 day highest pressure prior to the date of this Order. The pressure restrictions will remain in effect until the conditions of the Safety Order have been fulfilled. The Board must be satisfied that the affected pipelines of the NGTL System identified in this order can be operated safely at an increased pressure and in a manner that protects people and the environment.

In addition to meeting the conditions of this Safety Order, TransCanada will continue to be required to submit a detailed corrective action plan to address non-compliances identified in the Board's audit report of the company's integrity management program.

Yours truly,

Sheri Young
Secretary of the Board

c.c. Mr. Declan Russell, TransCanada PipeLines Limited, facsimile 403-920-2319

National Energy Board

Office national de l'énergie

ORDER SG-N081-001-2014

IN THE MATTER OF the *National Energy Board Act* (the Act) and the regulations made thereunder; and

IN THE MATTER OF promoting the safety and security of operation of the TransCanada Alberta system by TransCanada PipeLines Limited (TransCanada), National Energy Board (Board) file OF-Surv-Inc-2014-33 01.

BEFORE the Board on 4 March 2014.

WHEREAS the Board regulates the operation of the natural gas pipeline system owned and operated by Nova Gas Transmission Ltd. (NGTL) pursuant to Certificate GC-113;

AND WHEREAS NGTL is a wholly owned subsidiary of TranCanada, and NGTL is the owner of the Alberta System facilities;

AND WHEREAS TransCanada is required to comply, or cause NGTL to comply, with all of the conditions contained in Certificate GC-113, pursuant to section 1 of Certificate GC-113;

AND WHEREAS there have been a number of recent pipeline body leaks and ruptures on the NGTL system;

AND WHEREAS these pipeline body leaks and ruptures are under investigation by the Board;

AND WHEREAS several of these pipeline body leaks and ruptures have occurred on NGTL pipelines that are not able to be internally inspected using automated tools ("unpiggable);

AND WHEREAS TransCanada's monitoring of external corrosion on the NGTL system unpiggable pipelines was identified as a non-compliance during the Board's audit of TransCanada's integrity management program and that TransCanada will file a Corrective Action Plan responding to this finding with the Board;

AND WHEREAS public safety and protection of the environment are the Board's overriding priority;

…/2

AND WHEREAS the Board takes action pursuant to sections 12 and 48 of the Act to promote the continued safe and secure operation of the pipelines under its jurisdiction;

NOW THEREFORE, pursuant to sections 12 and 48 of the Act, the Board hereby orders the following safety measures:

1. Subject to the conditions of the Order, within 30 days from the date of this Order, the maximum operating pressure of the twenty-five (25) unpiggable NGTL pipelines that TransCanada has calculated to have the highest societal risk shall be reduced by 20% of the 90 day highest pressure from the date of the Order.

2. Within 35 days from the date of this Order, TransCanada shall file with the Board written confirmation that it has implemented the pressure restrictions. The written confirmation shall include the 90 day high pressure, the restricted operating pressure and confirmation that both the local and the control centre set-points for shutdown and control of the operation and isolation valves have been adjusted according to CSA Z662-11 Clauses 4.18 and 10.9.5 to reflect the pressure restrictions.

3. NGTL shall advise the Board of pipelines, if any, for which natural gas supply diminishment resulting from the pressure reductions outlined above are anticipated to result in a significant impact to public safety within the following 30 days.

4. The pressure restrictions shall remain in place until a plan and program to assess the integrity of the subject lines is approved by the Board and implemented by TransCanada.

5. TransCanada shall comply with all of the conditions of this Order unless the Board otherwise directs.

NATIONAL ENERGY BOARD

Sheri Young
Secretary of the Board

Appendix G

NACE ECDA STANDARD SP0502

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)

Appendix H

FEI IMP-P STANDARD

Appendix H-1

FEI CRL 1161 IMP-P STANDARD

IMP-P: Time Dependent Threat Management of Non-Piggable Pipelines

DOCUMENT NUMBER: **1161**
DOCUMENT TYPE: **STANDARD**
Owner: **Balmer, Bryan**
SML: **Thornton, Ian**
CATEGORY: **ENGINEERING - INTEGRITY MANAGEMENT PROGRAM**

Utility: **Gas**
Approved Date: **April 27, 2018**
Effective Date: **April 27, 2018**
Next Review Date: **April 29, 2019**

Document History: This document replaces 1161 IMP: Time Dependent Threat Management of Non-Piggable Pipelines dated 31 August 2016.

Summary of Changes

Replaced references to Standard CRL #1056 with CRL #1929 and #1930. Removed reference to IMP Activity Lead (now just Standard's SML). Elevated accountabilities for CA CI Management to Standard Owner. IMP references changed to IMP-P

Overview

Time Dependent Threat Management of Non-Piggable Pipelines is an activity within the Integrity Management Program. For the purposes of this standard, the term "Non-Piggable" includes all buried pipelines that are not currently monitored by in-line inspection per IMP-P: Threat Management for Piggable Pipelines, Standard #1082. This Standard is applicable to both steel and polyethylene (PE) pipeline material.

Audience

This standard is intended for all employees with accountabilities indicated in this standard.

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Defining Success

- Plans for time dependent threat management of Non-Piggable pipelines are developed, documented, executed, and updated as necessary (e.g. considering previously unknown asset condition data, potential enhancements to models as applicable, ROW clearing schedules as applicable, required resources, and new or emerging technologies for potential inclusion).
- Further investigation or mitigation is initiated and/or completed, as required.
- Records of the above are created in accordance with Policy #1878, Records Retention Policy
- Change is managed per Standard #1173 *IMP-P: Management of Change*.
- Continuous improvement of "IMP-P: Time Dependent Threat Management of Non-Piggable Pipelines" per Standard #1085, IMP-P: CA CI Management.

Description of Time Dependent Threat Management of Non-Piggable Pipelines

FortisBC implements the following IMP-P Activities as part of its management of potential time dependent threats/hazards to its buried steel and PE pipeline systems, regardless of whether an asset is in-line inspected or not:

- IMP-P: Pipe and Coating Condition Reporting, per Standard #1079
  - To ensure relevant asset condition data is available to various IMP-P activities (including this IMP-P activity, IMP-P Cathodic Protection, IMP-P Capital Planning, and potentially others), when buried steel pipe is exposed, selected data elements are recorded and transcribed into a database (GIS).
- IMP-P: Leak Management, per Standard #1071
  - To reduce the probability of significant consequences should a failure or damage incident occur (which may or may not be related to time dependent threats/hazards), all gas system piping is leak surveyed, and reported leaks are repaired and/or recorded as required.
- IMP-P: Corrective Work Management, per Standard #1070
  - To ensure identified deficiencies in asset condition or performance are appropriately actioned (which may or may not be related to time dependent threats/hazards), a framework of processes and technology to manage required corrective work to completion is developed, maintained and monitored for effectiveness.
- IMP-P: Capital Management, per Standard #1065
  - To ensure that identified integrity-related or other capital work is appropriately actioned (which may or may not be related to time dependent threats/hazards), work is prioritized, a long term capital budget is developed and approved, and approved capital work is completed.

- Inspecting Exposed Steel Pipe, per Specification 1480 (for buried steel pipe only)
    - Primarily to support the incremental activities described below for pipelines that are not currently in-line inspected, data is collected whenever a buried steel piping is exposed.

With consideration to the above IMP-P Activities, this standard defines the following incremental actions focused on time dependent threat management of buried pipelines that are not **currently** in-line inspected:

- For buried DP pipelines, including both steel and PE pipeline materials: prioritized renewal on an ongoing basis based on established risk factors (rationale: CSA Z662-15, Clause 12.10.3.3)
- For buried IP pipelines and Non-Piggable buried TP pipelines operating at less than 30% SMYS: condition assessment, including mitigation as required, upon a relevant leak history or as approved through an IMP-P Risk Assessment conducted per Standard #1272 IMP-P: Risk Management (rationale: CSA Z662-15, Clause 12.10.3.3, and BC Oil and Gas Activities Act, 37 (1) requirement to “prevent spillage”)
- For all Non-Piggable buried TP pipelines operating at 30% SMYS or greater not currently in-line inspected: condition assessment, including mitigation as required, on an ongoing basis (rationale: prevention of “significant consequences”, per Policy #1021, Integrity Management Policy)

Condition assessment for steel pipelines will typically follow a direct assessment (DA) methodology, as described later in this standard. FortisBC’s DA methodology is based on prior DA experience and is considered consistent with industry practice. Alternatives to DA, either as supplemental or in lieu, may be prescribed by any person identified in this standard as having accountability to create condition assessment plans, provided they can be demonstrated as being capable of proactive failure prevention.

Accountabilities

Key Components of Time Dependent Threat Management of Non-Piggable Pipelines	Activity	Accountability
Develop and execute plan(s) for time-dependent threat management of Non-Piggable TP and IP buried pipelines	Create, update and document a plan for condition assessment, including mitigation as required, of Non-Piggable TP pipelines operating at 30% SMYS or greater	Manager, System Integrity Programs
	Analyze leak and failure records for leaks caused by time dependent threats on Non-Piggable TP pipelines operating at less than 30% SMYS and/or for IP pipelines. Create, update and document a plan for condition assessment, including mitigation as required, of Non-Piggable TP pipelines operating at less than 30% SMYS and for IP pipelines upon a relevant leak history or as approved through an IMP-P Risk Assessment.	
	Complete inspections in accordance with the plan(s) for Non-Piggable TP and IP buried pipelines	
	Analyze inspection data	
	Perform further investigation and/or oversee execution of mitigation	
Develop and oversee execution of plan(s) for time-dependent threat management of DP buried pipelines	Create, update and document a risk model to prioritize segments of DP buried pipelines for asset renewal	Manager, Gas System Assets
	Create, update and document a plan for prioritized renewal of segments of DP buried pipelines	
	Complete renewal of identified buried DP pipeline segments in accordance with the plan.	
Develop and execute plan(s) for time dependent threat management of Non-Piggable TP and IP pipeline segments requiring condition monitoring,	Create, document, execute, and update as necessary a plan for site specific emergency response, as approved through an IMP-P Risk Assessment prepared in	Regional Manager

but that have been determined as non-inspectable	accordance with Standard #1272, IMP: Risk Management	
Develop and execute plan(s) for time dependent threat management of Non-Piggable TP and IP pipeline segments requiring mitigation, but that have been determined as non-repairable	Create, document, execute, and update as necessary a plan for scheduled capital replacement, as approved through an IMP-P Risk Assessment prepared in accordance with Standard #1272, IMP-P: Risk Management	Manager, Gas System Assets
Management of Change	Develop and maintain a list of potential changes that are unique to this IMP-P Activity that require managing; and to provide details on how to manage those changes, including: • Monitoring for change • Analysis the impacts of identified change • Approval and execution of selected action plans arising from the change, Details are stated in Appendix B.	The SML of this Standard
CA/CI Management	Creation of new CA's and CI's	The SML and/or the Owner of this Standard
	Assessment of new CI's	The Owner of this Standard
	Assignment of new CA's and selected CI's	The Owner of this Standard
	Completion of CA's and selected CI's	The Owner of this Standard

Relevant External References

- CSA Z662-15 Oil and Gas Pipeline Systems
  - Clause 10.3
  - Clause 12.10
- CGA OCC-1 Recommended Practice for the Control of External Corrosion on Buried or Submerged Metallic Piping Systems

Relevant Internal References

- Specification #1333, Corrosion Control
- Standard #1086, Gas System Asset Records Management
- Standard CRL #1929: Framework for Integrity Management Programs
- Standard CRL #1930: Integrity Management Program - Pipeline (IMP-P)
- Standard #1173, IMP-P: Management of Change
- Standard #1272, IMP-P: Risk Management
- Standard #1085, IMP-P: CA CI Management

- Standard #1082, IMP-P: Threat Management for Piggable Pipelines
- Policy #1878, Records Retention Policy
- Policy #1021, Integrity Management Policy

Records

- Plans for time-dependent condition monitoring (e.g. SAP, spreadsheets)
- Risk model for DP assets
- Inspection results
- Analysis records
- CP data management system (PCS)
- SAP (Notifications and Orders)

Direct Assessment (DA) Methodology for Buried Steel Pipelines

Time dependent threat management of Non-Piggable TP and IP buried steel pipelines through direct assessment utilizes a four step process as follows. A flow chart for this process is shown in Appendix A.

1. Pre-assessment: The pre-assessment step includes a review of pipeline or facility attributes, including:
    - Construction records
    - Location
    - Physical properties
    - Operating and maintenance history
    - Annual CP records
    - Previous indirect or direct inspection records.

    This step includes identification of pipeline segments installed by HDD or other methods where the pipeline segment may be considered non-accessible due to location or depth, and the DA process is not applicable. For these segments alternative threat management and/or consequence reduction strategies must be established through an IMP-P Risk Assessment, per Standard #1272, IMP-P: Risk Management (as required by Appendix B of this standard).

2. Indirect Inspection: The Indirect Inspection step includes aboveground inspections to assess CP effectiveness, identify coating faults, other anomalies, and areas where corrosion activity may have occurred or may be occurring. Two or more indirect inspection tools are used over the entire pipeline segment to provide improved detection reliability under the wide variety of conditions that may be encountered along a pipeline right-of-way.
3. Direct Examination: The Direct Examination step includes analyses of indirect inspection data to select sites for integrity excavations. The data from the direct examinations is utilized to identify and assess the effects of external corrosion on the pipeline, determine effectiveness of applied CP and validate coating condition. In addition, corrosion defect repairs, and mitigation of corrosion protection faults are included in this step.
4. Post-assessment: The Post-assessment step covers analyses of data collected from the previous three steps to assess the effectiveness of the DA process and determine reassessment frequencies.

Appendix A: DA Process Flow Chart for Buried Steel Pipelines

The DA process flow chart can be accessed through the link below:

https://crl.fortisbc.com/Documents/1161%20DA%20Process%20Flow%20Chart%20Aug%2031%202016.pdf

Appendix B: Detailed MOC requirements

Asset †	*Change category*	*Change*	*Monitoring for Change ††*	*Managing the Change †††*
All buried gas system assets	Technical	Changes to listed relevant external references	1. **How:** Per IMP-P Industry Awareness (Standard 1172) 2. **Who:** Per IMP-P Industry Awareness (Standard 1172) 3. **Frequency:** Per IMP-P Industry Awareness (Standard 1172) 4. **Threshold for action:** Any change directly affecting this standard 5. **Reported to:** The SML of this Standard 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** The SML of this Standard 2. **Approval:** Owner of this standard or other relevant standards 3. **Communication:** The SML of this Standard 4. **Execution:** The SML of this Standard 5. **Follow-up:** As required in the approval 6. **Documentation:** revisions to this standard or other relevant standards
All buried gas system assets	Procedural	Changes to listed relevant internal references	1. **How:** Manual 2. **Who:** The SML of this Standard 3. **Frequency:** Quarterly 4. **Threshold for action:** Any change directly affecting this standard 5. **Reported to:** The SML of this Standard 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** The SML of this Standard 2. **Approval:** Owner of this standard or other relevant standards 3. **Communication:** The SML of this Standard 4. **Execution:** The SML of this Standard 5. **Follow-up:** As required in the approval 6. **Documentation:** revisions to this standard or other relevant standards
All buried gas system assets	Procedural	Changes to the contents of this IMP Activity Standard	1. **How:** Manual 2. **Who:** The SML of this Standard 3. **Frequency:** Quarterly 4. **Threshold for action:** Any change directly affecting this standard 5. **Reported to:** The SML of this Standard 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** The SML of this Standard 2. **Approval:** Owner of this standard 3. **Communication:** The SML of this Standard 4. **Execution:** The SML of this Standard 5. **Follow-up:** As required in the approval 6. **Documentation:** Revisions to this standard
All buried gas	Physical	Addition, deletion or modifications to	1. **How:** Per Capital Management	1. **Analysis:** *

system assets		gas system assets, including the purchase or sale of assets	(Standard 1065) 2. **Who:** Per Capital Management (Standard 1065) 3. **Frequency:** Specific for each capital project 4. **Threshold for action:** Addition, deletion or modifications to gas system assets, including the purchase or sale of assets 5. **Reported to:** The SML of this Standard 6. **Documentation:** Per Capital Management (Standard 1065)	2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * As deemed appropriate by the SML of this Standard
All buried gas system assets	Organizational	Changes to competencies relevant to this IMP Activity	1. **How:** * 2. **Who:** * 3. **Frequency:** * 4. **Threshold for action:** * 5. **Reported to:** * 6. **Documentation:** * * Details will be determined as part of the Competency Management framework which is under development; ETA December, 2017	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * Details will be determined as part of the Competency Management framework which is under development; ETA December, 2017
All buried gas system assets	Organizational	Change of personnel involved with the condition assessment for Non-Piggable pipelines	1. **How:** On assignment of work 2. **Who:** Manager, System Integrity Programs 3. **Frequency:** Ongoing 4. **Threshold for action:** Person who does not have the competency to complete the assignment 5. **Reported to:** Manager, System Integrity Programs 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** Included on Manager Checklist for Internal Employee Change or Transfer (not retained) * Provide training; as required by the Manager, System Integrity Programs
All buried steel pipelines subject to a condition assessment per this standard	Physical	Indications of corrosion on Non-Piggable pipelines	1. **How:** Direct Examination 2. **Who:** Manager, System Integrity Programs 3. **Frequency:** Specific for each Direct Examination 4. **Threshold for action:** Per Engineering Assessments (Standard 1235) 5. **Reported to:** Integrity/Corrosion Control Analyst 2 6. **Documentation:** Per Engineering	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * Per Standard #1235, Engineering Assessments

			Assessments (Standard 1235)	
All exposed buried TP steel pipelines	Physical	Indications of corrosion	1. **How:** Field observation of exposed steel piping 2. **Who:** Regional Manager 3. **Frequency:** Upon pipe exposure due to any activity, including normal construction, third party crossings, or erosion 4. **Threshold for action:** Per Inspecting Exposed Steel Pipe (Spec #1480) 5. **Reported to:** Per Inspecting Exposed Steel Pipe (Spec #1480) 6. **Documentation:** Per Inspecting Exposed Steel Pipe (Spec #1480)	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * Per Standard #1235, Engineering Assessments
All buried gas system assets	Physical	Changes to industry practices related to equipment, evaluation criteria and processes	1. **How:** Manual 2. **Who:** The SML of this Standard 3. **Frequency:** Annually 4. **Threshold for action:** The SML of this Standard 5. **Reported to:** Manager, System Integrity Programs 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** The SML of this Standard 2. **Approval:** Owner of this standard or other relevant standards 3. **Communication:** The SML of this Standard 4. **Execution:** The SML of this Standard 5. **Follow-up:** As required in the approval 6. **Documentation:** Revisions to this standard or other relevant standards
Non-Piggable TP pipelines operating at greater than 30% SMYS	Procedural	Where the requirements of this standard for incremental time dependent threat mitigation are not met	1. **How:** Manual 2. **Who:** The SML of this Standard 3. **Frequency:** Quarterly 4. **Threshold for action:** Where no condition assessment plan exists for any new or existing TP pipeline operating at greater than 30% SMYS; 5. **Reported to:** Manager, Gas System Assets OR Manager, Engineering (Gas) OR Manager, System Integrity Programs 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * Per Standard #1272, IMP-P Risk Management
For any pipeline under an active DA	Procedural	When Direct Examination is not completed within 9 months of the	1. **How:** Manual 2. **Who:** The SML of this Standard	1. **Analysis:** * 2. **Approval:** *

evaluation		calendar year in which it is initiated and no alternative time dependent threat mitigation activity is implemented	3. **Frequency:** Quarterly 4. **Threshold for action:** When Direct Examination is not completed within 9 months of the calendar year in which it is initiated and no alternative time dependent threat mitigation activity is implemented. 5. **Reported to:** Manager, Gas System Assets OR Manager, Engineering (Gas) OR Manager, System Integrity Programs 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * Per Standard #1272, IMP-P Risk Management
All buried gas system assets	Organizational	Unacceptable decrease in performance of one or more metrics for this IMP-P Activity	1. **How:** Per IMP-P Review (standard 1075) 2. **Who:** The SML of this Standard 3. **Frequency:** Quarterly 4. **Threshold for action:** From green to yellow or red; or from yellow to red 5. **Reported to:** The SML of this Standard 6. **Documentation:** IMP-P Quarterly dashboard for this IMP-P Activity	1. **Analysis:** * 2. **Approval:** * 3. **Communication:** * 4. **Execution:** * 5. **Follow-up:** * 6. **Documentation:** * * As deemed appropriate; by the SML of this Standard

† ***Asset:*** This column may be deleted if it is not appropriate for this IMP-P Activity.

†† ***Monitoring for Change:***

1. **How:** How is the monitoring conducted?
2. **Who:** Who is accountable for the monitoring?
3. **Frequency:** How often is the monitoring required to be done?
4. **Threshold for action:** When is the change significant enough to trigger further action?
5. **Reported to:** Once that threshold is passed, who needs to be notified?
6. **Documentation:** What forms, reports, etc. are required; and where do they need to be filed?

††† ***Managing the Change:***

1. **Analysis:** Who is accountable to determine if any new hazards are created by the change; and if the risk associated with new or changed hazards is unacceptable? As appropriate, who is accountable to develop an action plan to accept or implement the change?
2. **Approval:** How needs to approve the analysis and proposed action plan, as appropriate?
3. **Communication:** If an action plan has been approved, who is accountable to communicate the approved action plan to appropriate stakeholders?
4. **Execution:** If an action plan has been approved, who is accountable to execute the action plan?
5. **Follow-up:** If the approval determines that follow-up is required to ensure no unintended hazards or risks have been created, who is accountable to ensure that it gets done?
6. **Documentation:** What forms, reports, etc. are required; and where do they need to be filed?

Communication and Enforcement

The IMP Activity Lead is expected to communicate with all employees who have been assigned accountabilities in this standard, of those accountabilities and for the need to comply with this standard. Those employees that have been assigned accountabilities in this standard are expected to communicate with others in the organization that support them in meeting the assigned accountabilities, of their existence and for the need to comply with this standard.

Related Information

Related Policies:

- 1021 Integrity Management Policy
- 1878 Records Retention Policy

Related Standards:

- 1086 Gas System Asset Records Management
- 1173 IMP-P: Management of Change
- 1272 IMP-P: Risk Management
- 1085 IMP-P: CA CI Management
- 1082 IMP-P: Time Dependent Threat Management for Piggable Pipelines
- 1929 Framework for Integrity Management Programs
- 1930 Integrity Management Program - Pipeline (IMP-P)

Related Specifications:

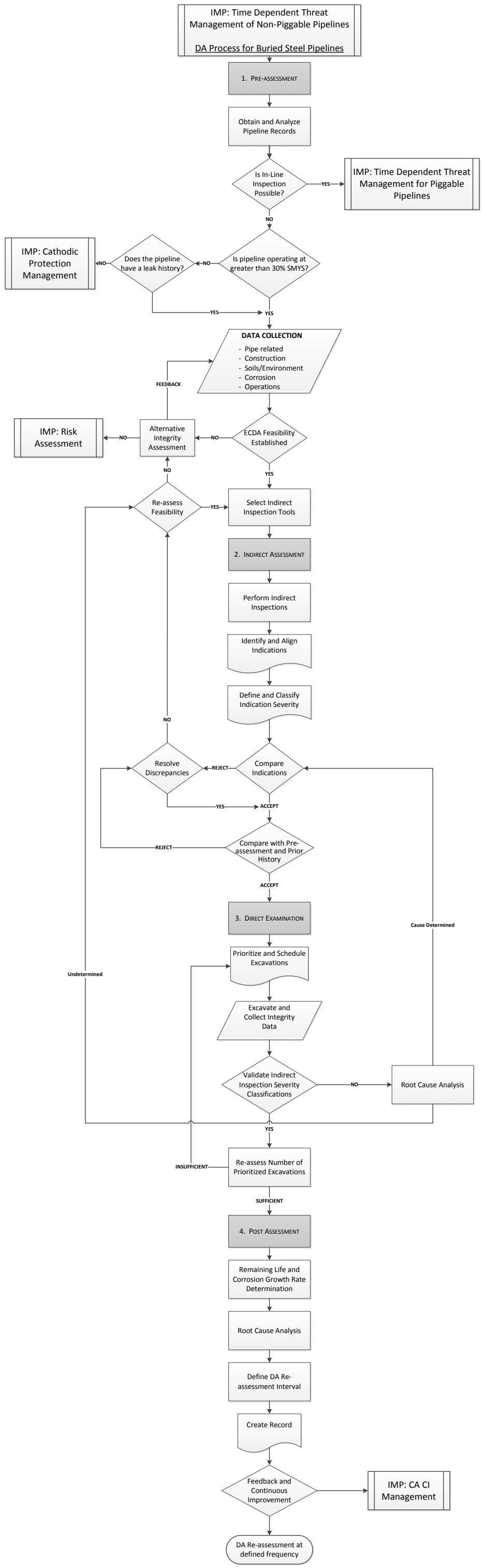
- 1333 Corrosion Control
- 1480 Inspecting Exposed Steel Pipe

Other References:

- DA Process Flow Chart

Appendix H-2

DA PROCESS FOR BURIED STEEL PIPELINES


IMP: Time Dependent Threat Management of Non-Piggable Pipelines
DA Process for Buried Steel Pipelines
1. Pre-assessment
Obtain and Analyze Pipeline Records
Is In-Line Inspection Possible?
YES
IMP: Time Dependent Threat Management for Piggable Pipelines
NO
Is pipeline operating at greater than 30% SMYS?
NO
Does the pipeline have a leak history?
NO
IMP: Cathodic Protection Management
YES
YES
DATA COLLECTION
- Pipe related
- Construction
- Soils/Environment
- Corrosion
- Operations
FEEDBACK
ECDA Feasibility Established
NO
Alternative Integrity Assessment
NO
IMP: Risk Assessment
YES
Re-assess Feasibility
NO
YES
Select Indirect Inspection Tools
2. Indirect Assessment
Perform Indirect Inspections
Identify and Align Indications
Define and Classify Indication Severity
Compare Indications
REJECT
Resolve Discrepancies
NO
YES
ACCEPT
Compare with Pre-assessment and Prior History
REJECT
ACCEPT
3. Direct Examination
Cause Determined
Prioritize and Schedule Excavations
Undetermined
Excavate and Collect Integrity Data
Validate Indirect Inspection Severity Classifications
NO
Root Cause Analysis
YES
INSUFFICIENT
Re-assess Number of Prioritized Excavations
SUFFICIENT
4. Post Assessment
Remaining Life and Corrosion Growth Rate Determination
Root Cause Analysis
Define DA Re-assessment Interval
Create Record
Feedback and Continuous Improvement
IMP: CA CI Management
DA Re-assessment at defined frequency

Appendix I

DETAILED EVALUTATION OF ALTERNATIVES

Overal Weightings	Weight
Project Execution & Lifecycle Operation	20%
Technical	45%
Financial	35%

Project Execution & Lifecycle Operation	Weight
Environmental	15%
Lands & ROW	15%
Consultation and Engagement Complexity	15%
Operational Complexity	25%
System Capacity & Customer Impacts	20%
Project Execution Certainty	10%

Technical	Weight
Prevention of Ruptures	45%
Prevention of Leaks	10%
Proactive Asset Management	25%
Technical Certainty	20%

Financial	Weight
Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100%
Rate Impact	0%
Retirement of Under-Depreciated Asset	0%

Alternative Evaluation Criteria – Definitions	
Technical	
Prevention of ruptures	• Prevent ruptures due to corrosion and existing mechanical damage, with a high degree of confidence
Prevention of leaks	• Prevent small leaks due to corrosion and existing mechanical damage, with a high degree of confidence
Proactive asset management	• Ability to make proactive repair/replace decisions based on asset condition over the lifecycle of the asset (allows for the identification and scheduling of corrective work with reasonable planning horizons) • Alignment with industry practice • Future opportunities (e.g. crack detection) • Other benefits: ground movement, centreline mapping, validation of records (e.g. W.T.), ability to project corrosion growth
Technical uncertainty	• Risk of not achieving technical Project Evaluation Criteria long-term, and reverting to another alternative
Project Execution & Lifecycle Operation	
Environmental	• Regulatory and permitting (e.g. MOE, DFO, Environment and Climate Change Canada, OGC, MFLNRO, etc.) • Existence of management areas (e.g. species at risk, protected areas) • Potential for contaminated sites • Waste development and disposal • Archaeological considerations • Soils and geology • Vegetation impacts • Timing restrictions • Potential for changes in regulation changes, increases in regulatory restrictions over the 50-year planning horizon • Watercourse impacts
Lands & ROW	• Land rights acquisition and lifecycle management complexity (e.g. absent property owners, potential for expropriation, existence of ALR, potential for changes to expectations/requirements) • Encroachment removal issues • Property activity impact (e.g. access, business impacts, agricultural impact, etc.) • Existing ROW suitability and restrictions/allowances • Bridge/rail crossing existence and annual rent payments • First Nations land tenures
Consultation and Engagement Complexity	• Communities (municipalities, regional districts) • First Nations • Stakeholders (MoTI, BC Hydro, other utilities, business associations, major industrial customers, etc.) • Risk of increased expectations for consultation and engagement • Increased expectation for community benefit/investment and First Nations capacity funding
Operational Complexity	• Operating phase of lifecycle only • Internal/external resources • Equipment & tools needs • Safety hazard exposure • Gas control / pressure control • Operational windows to execute work
System Capacity & Customer Impacts	• Sufficient capacity to execute alternative • Potential of the alternative to limit future capacity growth, including interruptible customers • Ability to provide unimpeded gas supply to customers (or… to enable unimpeded gas usage by customers) • Impacts to major industrial customers
Project Execution Certainty	• Constructability • Regulatory permitting • Timeline / schedule • Budget certainty • Scope certainty • Construction/internal resources
Financial	
Net Present Value (50 year) of Capital, O&M, and Retirement Cost	• Note: if values listed below are subject to change, all forumulas in Column Q of Sheet No. 10 must be modified (with all filters cleared prior to copying and pasting) • Score 5 = Option with the Lowest Net Present Value (50 year) • Score 4 = Option is 5% to 20% more expensive than Lowest NPV Option • Score 3 = Option is 20% to 50% more expensive than Lowest NPV Option • Score 2 = Option is 50% to 100% more expensive than Lowest NPV Option • Score 1 = Option is over 100% more expensive than Lowest NPV Option • Score 0 = No cost estimate was prepared for this Option

5 = Good
4 = Above Average
3 = Average
2 = Below Average
1 = Poor
0 = Not Acceptable / Not Feasible

Total (100%)										
Laterals	**Line Length (m)**	**ILI Program:** Pressure/Flow Control + In-Line Inspection + Digs	**ILI Program - Robotic:** Pressure/Flow Control + In-Line Inspection + Digs	**Pipeline Replacement:** Replacement (<30% SMYS) + Modified Direct Assessment	**100% Inspection, Repair & Re-coat + Direct Assessment Program:** Pressure Control + Direct Examination + Recoating + Direct Assessment (ECDA only)	**Pressure Regulating Station:** Regulating the Maximum Operating Pressure Below 30% SMYS	**Hydrostatic Testing Program:** Pressure Control + Hydrostatic Testing	**Status Quo:** Modified Direct Assessment with no Pressure Control	**1st Alternative**	**2nd Alternative**
1. MAC LTL 168	28678	4.6	2.7	3.1	2.3	1.8	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
2. MAC LOP 168	14248	4.6	2.7	3.5	2.3	1.8	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
3. BCF LTL 168	455	3.3	2.7	4.7	2.4	2.8	1.6	1.4	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
4. PG3 LTL 219	5345	3.2	2.7	3.1	2.2	4.0	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
5. NWP LTL 168	5989.0	3.2	2.6	3.0	2.2	3.9	1.4	1.4	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
6. NWP LOP 219	5823	3.2	2.6	3.0	2.2	3.9	1.6	1.4	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
7. PG1 LTL 168*	4713	4.6	2.7	3.5	2.3	1.8	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
8. PGP LTL 168*	1010	3.2	2.7	3.1	2.3	3.8	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
9. HUS LTL 168*	1114	3.2	2.7	3.5	2.3	3.8	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
10. PG2 219 168	8650	3.3	2.7	3.1	2.3	3.9	1.4	1.4	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
11. CAR LTL 168	1331	3.2	2.6	4.5	2.3	3.2	1.4	1.3	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS
12. WIL LP1/LP2 168	3384/2515	3.2	2.7	3.1	2.3	3.9	1.6	1.4	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
13.1. KA1 LTL 168	3570	3.6	2.7	4.6	2.3	1.8	1.4	1.3	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
13.2. KA1 LOP 168	3051	3.6	2.7	4.6	2.3	1.8	1.4	1.3	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
14. SAL LOP 168	44939	4.6	2.6	3.1	2.2	1.9	1.4	1.4	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
15. SA3 LTL 168	853	3.1	2.6	4.5	2.2	1.9	1.4	1.4	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
16. COL LTL 219	1822	3.2	2.6	3.8	2.2	3.9	1.4	1.4	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
17. COL LOP 168	3772	3.1	2.6	3.0	2.2	3.9	1.6	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
18. KE1 LOP 219	2109	3.1	2.5	3.8	2.1	3.9	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
19. CEL LTL 168	5783	3.6	2.7	3.1	2.3	3.8	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
20. CAS NEL 168	37366	3.2	2.6	3.1	2.2	3.8	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs
21. TRA LTL 168	4239	3.1	2.6	3.1	2.2	3.8	1.4	1.3	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
22. FRD LTL 219	34547/45112	4.6	2.6	3.0	2.2	1.8	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
23. ELK LTL 168	1565	3.6	2.7	4.5	2.3	3.8	1.4	1.3	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment	Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS

Total (100%)										
Laterals	**Line Length (m)**	**ILI Program:** Pressure/Flow Control + In-Line Inspection + Digs	**ILI Program - Robotic:** Pressure/Flow Control + In-Line Inspection + Digs	**Pipeline Replacement:** Replacement (<30% SMYS) + Modified Direct Assessment	**100% Inspection, Repair & Re-coat + Direct Assessment Program:** Pressure Control + Direct Examination + Recoating + Direct Assessment (ECDA only)	**Pressure Regulating Station:** Regulating the Maximum Operating Pressure Below 30% SMYS	**Hydrostatic Testing Program:** Pressure Control + Hydrostatic Testing	**Status Quo:** Modified Direct Assessment with no Pressure Control	**1st Alternative**	**2nd Alternative**
24. CRK LTL 168	34028	4.6	2.6	3.1	2.2	1.9	1.6	1.4	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
25. CRK LOP 219	34030	4.6	2.6	3.1	2.2	1.9	1.6	1.4	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
26. CRK LP2 219	4007	4.6	2.6	3.1	2.2	1.9	1.6	1.4	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
27. CRK LOP 273	9409	4.6	2.6	3.0	2.2	1.9	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
28. KBY LTL 168	20573	4.6	2.6	3.1	2.2	1.9	1.4	1.4	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment
29. SSK LTL 219	35931	4.6	2.6	3.0	2.2	1.9	1.4	1.3	ILI Program: Pressure/Flow Control + In-Line Inspection + Digs	Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment

Project Execution & Lifecycle Operation							
Laterals	**ILI Program: Pressure/Flow Control + In-Line Inspection + Digs**	**ILI Program - Robotic: Pressure/Flow Control + In-Line Inspection + Digs**	**Replacement: Replacement (<30% SMYS) + Modified Direct Assessment**	**100% Inspection, Repair & Re-coat + Direct Assessment Program: Pressure Control + Direct Examination + Recoating + Direct Assessment (ECDA only)**	**Hydrostatic Testing Program: Pressure Control + Hydrostatic Testing**	**Status Quo: Modified Direct Assessment with no Pressure Control**	**Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS2**
1. MAC LTL 168	3.45	3.5	3.3	2.5	0.8	2.7	2.8
2. MAC LOP 168	3.45	3.5	3.3	2.5	0.8	2.7	2.8
3. BCF LTL 168	3.75	3.65	4.2	3.1	1.8	3.15	3.95
4. PG3 LTL 219	3.45	3.5	3.3	2.35	0.8	2.7	4.6
5. NWP LTL 168	3.3	3.35	3	2.35	0.8	2.95	4.3
6. NWP LOP 219	3.4	3.35	3	2.35	1.8	2.95	4.3
7. PG1 LTL 168*	3.45	3.5	3.3	2.5	0.8	2.7	2.8
8. PGP LTL 168*	3.45	3.5	3.3	2.5	0.8	2.7	3.8
9. HUS LTL 168*	3.45	3.5	3.3	2.5	0.8	2.7	3.8
10. PG2 219 168	3.7	3.5	3.3	2.5	0.8	2.95	4.3
11. CAR LTL 168	3.3	3.35	3.3	2.65	0.8	2.8	4.3
12. WIL LP1/LP2 168	3.45	3.5	3.3	2.5	1.8	3.2	4.3
13.1. KA1 LTL 168	3.45	3.5	3.6	2.5	0.8	2.55	2.8
13.2. KA1 LOP 168	3.45	3.5	3.6	2.5	0.8	2.55	2.8
14. SAL LOP 168	3.4	3.35	3.15	2.35	0.8	2.95	3.3
15. SA3 LTL 168	2.75	3.35	3.3	2.35	0.8	2.95	3.3
16. COL LTL 219	3.3	3.35	3.15	2.35	0.8	2.95	4.3
17. COL LOP 168	3.15	3.05	3	2.35	1.8	2.8	4.3
18. KE1 LOP 219	2.75	2.65	3.15	1.85	0.8	2.55	4.3
19. CEL LTL 168	3.45	3.5	3.3	2.5	0.8	2.7	3.95
20. CAS NEL 168	3.2	3.25	3.3	2.25	0.8	2.7	3.95
21. TRA LTL 168	3.05	3.1	3.45	2.35	0.8	2.4	3.8
22. FRD LTL 219	3.3	3.35	3	2.35	0.8	2.55	2.8
23. ELK LTL 168	3.45	3.5	3.3	2.5	0.8	2.7	3.8
24. CRK LTL 168	3.4	3.35	3.15	2.35	1.8	2.95	3.3
25. CRK LOP 219	3.4	3.35	3.15	2.35	1.8	2.95	3.3
26. CRK LP2 219	3.4	3.35	3.15	2.35	1.8	3.2	3.3
27. CRK LOP 273	3.4	3.2	3	2.35	0.8	2.8	3.3
28. KBY LTL 168	3.4	3.35	3.15	2.35	0.8	2.95	3.3
29. SSK LTL 219	3.25	3.2	3	2.35	0.8	2.8	3.3

Technical							
Laterals	**ILI Program: Pressure/Flow Control + In-Line Inspection + Digs**	**ILI Program - Robotic: Pressure/Flow Control + In-Line Inspection + Digs**	**Replacement: Replacement (<30% SMYS) + Modified Direct Assessment**	**100% Inspection, Repair & Re-coat + Direct Assessment Program: Pressure Control + Direct Examination + Recoating + Direct Assessment (ECDA only)**	**Hydrostatic Testing Program: Pressure Control + Hydrostatic Testing**	**Status Quo: Modified Direct Assessment with no Pressure Control**	**Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS**
1. MAC LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
2. MAC LOP 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
3. BCF LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
4. PG3 LTL 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
5. NWP LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
6. NWP LOP 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
7. PG1 LTL 168*	4.8	4.4	4.7	4.0	2.9	1.8	2.9
8. PGP LTL 168*	4.8	4.4	4.7	4.0	2.9	1.8	2.9
9. HUS LTL 168*	4.8	4.4	4.7	4.0	2.9	1.8	2.9
10. PG2 219 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
11. CAR LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
12. WIL LP1/LP2 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
13.1. KA1 LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
13.2. KA1 LOP 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
14. SAL LOP 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
15. SA3 LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
16. COL LTL 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
17. COL LOP 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
18. KE1 LOP 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
19. CEL LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
20. CAS NEL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
21. TRA LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
22. FRD LTL 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
23. ELK LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
24. CRK LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
25. CRK LOP 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
26. CRK LP2 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9
27. CRK LOP 273	4.8	4.4	4.7	4.0	2.9	1.8	2.9
28. KBY LTL 168	4.8	4.4	4.7	4.0	2.9	1.8	2.9
29. SSK LTL 219	4.8	4.4	4.7	4.0	2.9	1.8	2.9

Financial							
Laterals	**ILI Program: Pressure/Flow Control + In-Line Inspection + Digs**	**ILI Program - Robotic: Pressure/Flow Control + In-Line Inspection + Digs**	**Pipeline Replacement: Replacement (<30% SMYS) + Modified Direct Assessment**	**100% Inspection, Repair & Re-coat + Direct Assessment Program: Pressure Control + Direct Examination + Recoating + Direct Assessment (ECDA only)**	**Hydrostatic Testing Program: Pressure Control + Hydrostatic Testing**	**Status Quo: Modified Direct Assessment with no Pressure Control**	**Pressure Regulating Station: Regulating the Maximum Operating Pressure Below 30% SMYS**
1. MAC LTL 168	5	0	1	0	0		0
2. MAC LOP 168	5	0	2	0	0		0
3. BCF LTL 168	1	0	5	0	0		2
4. PG3 LTL 219	1	0	1	0	0		5
5. NWP LTL 168	1	0	1	0	0		5
6. NWP LOP 219	1	0	1	0	0		5
7. PG1 LTL 168*	5	0	2	0	0		0
8. PGP LTL 168*	1	0	1	0	0		5
9. HUS LTL 168*	1	0	2	0	0		5
10. PG2 219 168	1	0	1	0	0		5
11. CAR LTL 168	1	0	5	0	0		3
12. WIL LP1/LP2 168	1	0	1	0	0		5
13.1. KA1 LTL 168	2	0	5	0	0		0
13.2. KA1 LOP 168	2	0	5	0	0		0
14. SAL LOP 168	5	0	1	0	0		0
15. SA3 LTL 168	1	0	5	0	0		0
16. COL LTL 219	1	0	3	0	0		5
17. COL LOP 168	1	0	1	0	0		5
18. KE1 LOP 219	1	0	3	0	0		5
19. CEL LTL 168	2	0	1	0	0		5
20. CAS NEL 168	1	0	1	0	0		5
21. TRA LTL 168	1	0	1	0	0		5
22. FRD LTL 219	5	0	1	0	0		0
23. ELK LTL 168	2	0	5	0	0		5
24. CRK LTL 168	5	0	1	0	0		0
25. CRK LOP 219	5	0	1	0	0		0
26. CRK LP2 219	5	0	1	0	0		0
27. CRK LOP 273	5	0	1	0	0		0
28. KBY LTL 168	5	0	1	0	0		0
29. SSK LTL 219	5	0	1	0	0		0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
1. MAC LTL 168	Prevention of ruptures	ILI Program:	5
1. MAC LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
1. MAC LTL 168	Prevention of ruptures	Replacement:	5
1. MAC LTL 168	Prevention of ruptures	100% Inspection,	5
1. MAC LTL 168	Prevention of ruptures	Pressure Regulating	5
1. MAC LTL 168	Prevention of ruptures	Hydrostatic Testing	5
1. MAC LTL 168	Prevention of ruptures	Status Quo: Modified	2
1. MAC LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
1. MAC LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
1. MAC LTL 168	Prevention of leaks with significant consequences	Replacement:	4
1. MAC LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
1. MAC LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
1. MAC LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
1. MAC LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
1. MAC LTL 168	Proactive asset management	ILI Program:	5
1. MAC LTL 168	Proactive asset management	ILI Program - Robotic:	4
1. MAC LTL 168	Proactive asset management	Replacement:	4
1. MAC LTL 168	Proactive asset management	100% Inspection,	2
1. MAC LTL 168	Proactive asset management	Pressure Regulating	0
1. MAC LTL 168	Proactive asset management	Hydrostatic Testing	0
1. MAC LTL 168	Proactive asset management	Status Quo: Modified	1
1. MAC LTL 168	Technical certainty	ILI Program:	4
1. MAC LTL 168	Technical certainty	ILI Program - Robotic:	3
1. MAC LTL 168	Technical certainty	Replacement:	5
1. MAC LTL 168	Technical certainty	100% Inspection,	4
1. MAC LTL 168	Technical certainty	Pressure Regulating	3
1. MAC LTL 168	Technical certainty	Hydrostatic Testing	3
1. MAC LTL 168	Technical certainty	Status Quo: Modified	2
2. MAC LOP 168	Prevention of ruptures	ILI Program:	5
2. MAC LOP 168	Prevention of ruptures	ILI Program - Robotic:	5
2. MAC LOP 168	Prevention of ruptures	Replacement:	5
2. MAC LOP 168	Prevention of ruptures	100% Inspection,	5
2. MAC LOP 168	Prevention of ruptures	Pressure Regulating	5
2. MAC LOP 168	Prevention of ruptures	Hydrostatic Testing	5
2. MAC LOP 168	Prevention of ruptures	Status Quo: Modified	2
2. MAC LOP 168	Prevention of leaks with significant consequences	ILI Program:	5
2. MAC LOP 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
2. MAC LOP 168	Prevention of leaks with significant consequences	Replacement:	4
2. MAC LOP 168	Prevention of leaks with significant consequences	100% Inspection,	4
2. MAC LOP 168	Prevention of leaks with significant consequences	Pressure Regulating	0
2. MAC LOP 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
2. MAC LOP 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
2. MAC LOP 168	Proactive asset management	ILI Program:	5
2. MAC LOP 168	Proactive asset management	ILI Program - Robotic:	4
2. MAC LOP 168	Proactive asset management	Replacement:	4
2. MAC LOP 168	Proactive asset management	100% Inspection,	2
2. MAC LOP 168	Proactive asset management	Pressure Regulating	0
2. MAC LOP 168	Proactive asset management	Hydrostatic Testing	0
2. MAC LOP 168	Proactive asset management	Status Quo: Modified	1
2. MAC LOP 168	Technical certainty	ILI Program:	4
2. MAC LOP 168	Technical certainty	ILI Program - Robotic:	3
2. MAC LOP 168	Technical certainty	Replacement:	5
2. MAC LOP 168	Technical certainty	100% Inspection,	4
2. MAC LOP 168	Technical certainty	Pressure Regulating	3
2. MAC LOP 168	Technical certainty	Hydrostatic Testing	3
2. MAC LOP 168	Technical certainty	Status Quo: Modified	2
3. BCF LTL 168	Prevention of ruptures	ILI Program:	5
3. BCF LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
3. BCF LTL 168	Prevention of ruptures	Replacement:	5
3. BCF LTL 168	Prevention of ruptures	100% Inspection,	5
3. BCF LTL 168	Prevention of ruptures	Pressure Regulating	5
3. BCF LTL 168	Prevention of ruptures	Hydrostatic Testing	5
3. BCF LTL 168	Prevention of ruptures	Status Quo: Modified	2
3. BCF LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
3. BCF LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
3. BCF LTL 168	Prevention of leaks with significant consequences	Replacement:	4
3. BCF LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
3. BCF LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
3. BCF LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
3. BCF LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
3. BCF LTL 168	Proactive asset management	ILI Program:	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	137%	1	-	1
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
1. MAC LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified			-	
1. MAC LTL 168	Rate impact	ILI Program:		-	0	0
1. MAC LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
1. MAC LTL 168	Rate impact	Replacement:		-	0	0
1. MAC LTL 168	Rate impact	100% Inspection,		-	0	0
1. MAC LTL 168	Rate impact	Pressure Regulating		-	0	0
1. MAC LTL 168	Rate impact	Hydrostatic Testing		-	0	0
1. MAC LTL 168	Rate impact	Status Quo: Modified		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
1. MAC LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	154%	2	-	2
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
2. MAC LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
2. MAC LOP 168	Rate impact	ILI Program:		-	0	0
2. MAC LOP 168	Rate impact	ILI Program - Robotic:		-	0	0
2. MAC LOP 168	Rate impact	Replacement:		-	0	0
2. MAC LOP 168	Rate impact	100% Inspection,		-	0	0
2. MAC LOP 168	Rate impact	Pressure Regulating		-	0	0
2. MAC LOP 168	Rate impact	Hydrostatic Testing		-	0	0
2. MAC LOP 168	Rate impact	Status Quo: Modified		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	Replacement:		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
2. MAC LOP 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	86%	1	-	1
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	0%	5	-	5
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		2	-	2
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing	853%	0	-	0
3. BCF LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
3. BCF LTL 168	Rate impact	ILI Program:		-	0	0
3. BCF LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
3. BCF LTL 168	Rate impact	Replacement:		-	0	0
3. BCF LTL 168	Rate impact	100% Inspection,		-	0	0
3. BCF LTL 168	Rate impact	Pressure Regulating		-	0	0
3. BCF LTL 168	Rate impact	Hydrostatic Testing		-	0	0
3. BCF LTL 168	Rate impact	Status Quo: Modified		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
3. BCF LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	639%	1	-	1
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	1585%	1	-	1
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating	0%	5	-	5
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
4. PG3 LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
4. PG3 LTL 219	Rate impact	ILI Program:		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
3. BCF LTL 168	Proactive asset management	ILI Program - Robotic:	4
3. BCF LTL 168	Proactive asset management	Replacement:	4
3. BCF LTL 168	Proactive asset management	100% Inspection,	2
3. BCF LTL 168	Proactive asset management	Pressure Regulating	0
3. BCF LTL 168	Proactive asset management	Hydrostatic Testing	0
3. BCF LTL 168	Proactive asset management	Status Quo: Modified	1
3. BCF LTL 168	Technical certainty	ILI Program:	4
3. BCF LTL 168	Technical certainty	ILI Program - Robotic:	3
3. BCF LTL 168	Technical certainty	Replacement:	5
3. BCF LTL 168	Technical certainty	100% Inspection,	4
3. BCF LTL 168	Technical certainty	Pressure Regulating	3
3. BCF LTL 168	Technical certainty	Hydrostatic Testing	3
3. BCF LTL 168	Technical certainty	Status Quo: Modified	2
4. PG3 LTL 219	Prevention of ruptures	ILI Program:	5
4. PG3 LTL 219	Prevention of ruptures	ILI Program - Robotic:	5
4. PG3 LTL 219	Prevention of ruptures	Replacement:	5
4. PG3 LTL 219	Prevention of ruptures	100% Inspection,	5
4. PG3 LTL 219	Prevention of ruptures	Pressure Regulating	5
4. PG3 LTL 219	Prevention of ruptures	Hydrostatic Testing	5
4. PG3 LTL 219	Prevention of ruptures	Status Quo: Modified	2
4. PG3 LTL 219	Prevention of leaks with significant consequences	ILI Program:	5
4. PG3 LTL 219	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
4. PG3 LTL 219	Prevention of leaks with significant consequences	Replacement:	4
4. PG3 LTL 219	Prevention of leaks with significant consequences	100% Inspection,	4
4. PG3 LTL 219	Prevention of leaks with significant consequences	Pressure Regulating	0
4. PG3 LTL 219	Prevention of leaks with significant consequences	Hydrostatic Testing	0
4. PG3 LTL 219	Prevention of leaks with significant consequences	Status Quo: Modified	2
4. PG3 LTL 219	Proactive asset management	ILI Program:	5
4. PG3 LTL 219	Proactive asset management	ILI Program - Robotic:	4
4. PG3 LTL 219	Proactive asset management	Replacement:	4
4. PG3 LTL 219	Proactive asset management	100% Inspection,	2
4. PG3 LTL 219	Proactive asset management	Pressure Regulating	0
4. PG3 LTL 219	Proactive asset management	Hydrostatic Testing	0
4. PG3 LTL 219	Proactive asset management	Status Quo: Modified	1
4. PG3 LTL 219	Technical certainty	ILI Program:	4
4. PG3 LTL 219	Technical certainty	ILI Program - Robotic:	3
4. PG3 LTL 219	Technical certainty	Replacement:	5
4. PG3 LTL 219	Technical certainty	100% Inspection,	4
4. PG3 LTL 219	Technical certainty	Pressure Regulating	3
4. PG3 LTL 219	Technical certainty	Hydrostatic Testing	3
4. PG3 LTL 219	Technical certainty	Status Quo: Modified	2
5. NWP LTL 168	Prevention of ruptures	ILI Program:	5
5. NWP LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
5. NWP LTL 168	Prevention of ruptures	Replacement:	5
5. NWP LTL 168	Prevention of ruptures	100% Inspection,	5
5. NWP LTL 168	Prevention of ruptures	Pressure Regulating	5
5. NWP LTL 168	Prevention of ruptures	Hydrostatic Testing	5
5. NWP LTL 168	Prevention of ruptures	Status Quo: Modified	2
5. NWP LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
5. NWP LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
5. NWP LTL 168	Prevention of leaks with significant consequences	Replacement:	4
5. NWP LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
5. NWP LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
5. NWP LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
5. NWP LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
5. NWP LTL 168	Proactive asset management	ILI Program:	5
5. NWP LTL 168	Proactive asset management	ILI Program - Robotic:	4
5. NWP LTL 168	Proactive asset management	Replacement:	4
5. NWP LTL 168	Proactive asset management	100% Inspection,	2
5. NWP LTL 168	Proactive asset management	Pressure Regulating	0
5. NWP LTL 168	Proactive asset management	Hydrostatic Testing	0
5. NWP LTL 168	Proactive asset management	Status Quo: Modified	1
5. NWP LTL 168	Technical certainty	ILI Program:	4
5. NWP LTL 168	Technical certainty	ILI Program - Robotic:	3
5. NWP LTL 168	Technical certainty	Replacement:	5
5. NWP LTL 168	Technical certainty	100% Inspection,	4
5. NWP LTL 168	Technical certainty	Pressure Regulating	3
5. NWP LTL 168	Technical certainty	Hydrostatic Testing	3
5. NWP LTL 168	Technical certainty	Status Quo: Modified	2
6. NWP LOP 219	Prevention of ruptures	ILI Program:	5
6. NWP LOP 219	Prevention of ruptures	ILI Program - Robotic:	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
4. PG3 LTL 219	Rate impact	ILI Program - Robotic:		-	0	0
4. PG3 LTL 219	Rate impact	Replacement:		-	0	0
4. PG3 LTL 219	Rate impact	100% Inspection,		-	0	0
4. PG3 LTL 219	Rate impact	Pressure Regulating		-	0	0
4. PG3 LTL 219	Rate impact	Hydrostatic Testing		-	0	0
4. PG3 LTL 219	Rate impact	Status Quo: Modified		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	ILI Program:		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	Replacement:		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	100% Inspection,		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
4. PG3 LTL 219	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	554%	1	-	1
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	1727%	1	-	1
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating	0%	5	-	5
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
5. NWP LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
5. NWP LTL 168	Rate impact	ILI Program:		-	0	0
5. NWP LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
5. NWP LTL 168	Rate impact	Replacement:		-	0	0
5. NWP LTL 168	Rate impact	100% Inspection,		-	0	0
5. NWP LTL 168	Rate impact	Pressure Regulating		-	0	0
5. NWP LTL 168	Rate impact	Hydrostatic Testing		-	0	0
5. NWP LTL 168	Rate impact	Status Quo: Modified		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
5. NWP LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	339%	1	-	1
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	2107%	1	-	1
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating	0%	5	-	5
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
6. NWP LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
6. NWP LOP 219	Rate impact	ILI Program:		-	0	0
6. NWP LOP 219	Rate impact	ILI Program - Robotic:		-	0	0
6. NWP LOP 219	Rate impact	Replacement:		-	0	0
6. NWP LOP 219	Rate impact	100% Inspection,		-	0	0
6. NWP LOP 219	Rate impact	Pressure Regulating		-	0	0
6. NWP LOP 219	Rate impact	Hydrostatic Testing		-	0	0
6. NWP LOP 219	Rate impact	Status Quo: Modified		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	ILI Program:		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	Replacement:		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	100% Inspection,		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
6. NWP LOP 219	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	224%	2	-	2
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
7. PG1 LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
7. PG1 LTL 168*	Rate impact	ILI Program:		-	0	0
7. PG1 LTL 168*	Rate impact	ILI Program - Robotic:		-	0	0
7. PG1 LTL 168*	Rate impact	Replacement:		-	0	0
7. PG1 LTL 168*	Rate impact	100% Inspection,		-	0	0
7. PG1 LTL 168*	Rate impact	Pressure Regulating		-	0	0
7. PG1 LTL 168*	Rate impact	Hydrostatic Testing		-	0	0
7. PG1 LTL 168*	Rate impact	Status Quo: Modified		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	ILI Program:		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
6. NWP LOP 219	Prevention of ruptures	**Replacement:**	5
6. NWP LOP 219	Prevention of ruptures	**100% Inspection,**	5
6. NWP LOP 219	Prevention of ruptures	**Pressure Regulating**	5
6. NWP LOP 219	Prevention of ruptures	**Hydrostatic Testing**	5
6. NWP LOP 219	Prevention of ruptures	**Status Quo: Modified**	2
6. NWP LOP 219	Prevention of leaks with significant consequences	**ILI Program:**	5
6. NWP LOP 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
6. NWP LOP 219	Prevention of leaks with significant consequences	**Replacement:**	4
6. NWP LOP 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
6. NWP LOP 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
6. NWP LOP 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
6. NWP LOP 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
6. NWP LOP 219	Proactive asset management	**ILI Program:**	5
6. NWP LOP 219	Proactive asset management	**ILI Program - Robotic:**	4
6. NWP LOP 219	Proactive asset management	**Replacement:**	4
6. NWP LOP 219	Proactive asset management	**100% Inspection,**	2
6. NWP LOP 219	Proactive asset management	**Pressure Regulating**	0
6. NWP LOP 219	Proactive asset management	**Hydrostatic Testing**	0
6. NWP LOP 219	Proactive asset management	**Status Quo: Modified**	1
6. NWP LOP 219	Technical certainty	**ILI Program:**	4
6. NWP LOP 219	Technical certainty	**ILI Program - Robotic:**	3
6. NWP LOP 219	Technical certainty	**Replacement:**	5
6. NWP LOP 219	Technical certainty	**100% Inspection,**	4
6. NWP LOP 219	Technical certainty	**Pressure Regulating**	3
6. NWP LOP 219	Technical certainty	**Hydrostatic Testing**	3
6. NWP LOP 219	Technical certainty	**Status Quo: Modified**	2
7. PG1 LTL 168*	Prevention of ruptures	**ILI Program:**	5
7. PG1 LTL 168*	Prevention of ruptures	**ILI Program - Robotic:**	5
7. PG1 LTL 168*	Prevention of ruptures	**Replacement:**	5
7. PG1 LTL 168*	Prevention of ruptures	**100% Inspection,**	5
7. PG1 LTL 168*	Prevention of ruptures	**Pressure Regulating**	5
7. PG1 LTL 168*	Prevention of ruptures	**Hydrostatic Testing**	5
7. PG1 LTL 168*	Prevention of ruptures	**Status Quo: Modified**	2
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**ILI Program:**	5
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**Replacement:**	4
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**100% Inspection,**	4
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**Pressure Regulating**	0
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
7. PG1 LTL 168*	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
7. PG1 LTL 168*	Proactive asset management	**ILI Program:**	5
7. PG1 LTL 168*	Proactive asset management	**ILI Program - Robotic:**	4
7. PG1 LTL 168*	Proactive asset management	**Replacement:**	4
7. PG1 LTL 168*	Proactive asset management	**100% Inspection,**	2
7. PG1 LTL 168*	Proactive asset management	**Pressure Regulating**	0
7. PG1 LTL 168*	Proactive asset management	**Hydrostatic Testing**	0
7. PG1 LTL 168*	Proactive asset management	**Status Quo: Modified**	1
7. PG1 LTL 168*	Technical certainty	**ILI Program:**	4
7. PG1 LTL 168*	Technical certainty	**ILI Program - Robotic:**	3
7. PG1 LTL 168*	Technical certainty	**Replacement:**	5
7. PG1 LTL 168*	Technical certainty	**100% Inspection,**	4
7. PG1 LTL 168*	Technical certainty	**Pressure Regulating**	3
7. PG1 LTL 168*	Technical certainty	**Hydrostatic Testing**	3
7. PG1 LTL 168*	Technical certainty	**Status Quo: Modified**	2
8. PGP LTL 168*	Prevention of ruptures	**ILI Program:**	5
8. PGP LTL 168*	Prevention of ruptures	**ILI Program - Robotic:**	5
8. PGP LTL 168*	Prevention of ruptures	**Replacement:**	5
8. PGP LTL 168*	Prevention of ruptures	**100% Inspection,**	5
8. PGP LTL 168*	Prevention of ruptures	**Pressure Regulating**	5
8. PGP LTL 168*	Prevention of ruptures	**Hydrostatic Testing**	5
8. PGP LTL 168*	Prevention of ruptures	**Status Quo: Modified**	2
8. PGP LTL 168*	Prevention of leaks with significant consequences	**ILI Program:**	5
8. PGP LTL 168*	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
8. PGP LTL 168*	Prevention of leaks with significant consequences	**Replacement:**	4
8. PGP LTL 168*	Prevention of leaks with significant consequences	**100% Inspection,**	4
8. PGP LTL 168*	Prevention of leaks with significant consequences	**Pressure Regulating**	0
8. PGP LTL 168*	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
8. PGP LTL 168*	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
8. PGP LTL 168*	Proactive asset management	**ILI Program:**	5
8. PGP LTL 168*	Proactive asset management	**ILI Program - Robotic:**	4
8. PGP LTL 168*	Proactive asset management	**Replacement:**	4

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
7. PG1 LTL 168*	Retirement of under-depreciated asset	**Replacement:**		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
7. PG1 LTL 168*	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	1	-	1
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	16%	1	-	1
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
8. PGP LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
8. PGP LTL 168*	Rate impact	**ILI Program:**		-	0	0
8. PGP LTL 168*	Rate impact	**ILI Program - Robotic:**		-	0	0
8. PGP LTL 168*	Rate impact	**Replacement:**		-	0	0
8. PGP LTL 168*	Rate impact	**100% Inspection,**		-	0	0
8. PGP LTL 168*	Rate impact	**Pressure Regulating**		-	0	0
8. PGP LTL 168*	Rate impact	**Hydrostatic Testing**		-	0	0
8. PGP LTL 168*	Rate impact	**Status Quo: Modified**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**Replacement:**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
8. PGP LTL 168*	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	7%	1	-	1
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	0%	2	-	2
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
9. HUS LTL 168*	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
9. HUS LTL 168*	Rate impact	**ILI Program:**		-	0	0
9. HUS LTL 168*	Rate impact	**ILI Program - Robotic:**		-	0	0
9. HUS LTL 168*	Rate impact	**Replacement:**		-	0	0
9. HUS LTL 168*	Rate impact	**100% Inspection,**		-	0	0
9. HUS LTL 168*	Rate impact	**Pressure Regulating**		-	0	0
9. HUS LTL 168*	Rate impact	**Hydrostatic Testing**		-	0	0
9. HUS LTL 168*	Rate impact	**Status Quo: Modified**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**Replacement:**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
9. HUS LTL 168*	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	226%	1	-	1
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	543%	1	-	1
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**	0%	5	-	5
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
10. PG2 219 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
10. PG2 219 168	Rate impact	**ILI Program:**		-	0	0
10. PG2 219 168	Rate impact	**ILI Program - Robotic:**		-	0	0
10. PG2 219 168	Rate impact	**Replacement:**		-	0	0
10. PG2 219 168	Rate impact	**100% Inspection,**		-	0	0
10. PG2 219 168	Rate impact	**Pressure Regulating**		-	0	0
10. PG2 219 168	Rate impact	**Hydrostatic Testing**		-	0	0
10. PG2 219 168	Rate impact	**Status Quo: Modified**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
10. PG2 219 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	69%	1	-	1
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	79%	5	-	5

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
8. PGP LTL 168*	Proactive asset management	100% Inspection,	2
8. PGP LTL 168*	Proactive asset management	Pressure Regulating	0
8. PGP LTL 168*	Proactive asset management	Hydrostatic Testing	0
8. PGP LTL 168*	Proactive asset management	Status Quo: Modified	1
8. PGP LTL 168*	Technical certainty	ILI Program:	4
8. PGP LTL 168*	Technical certainty	ILI Program - Robotic:	3
8. PGP LTL 168*	Technical certainty	Replacement:	5
8. PGP LTL 168*	Technical certainty	100% Inspection,	4
8. PGP LTL 168*	Technical certainty	Pressure Regulating	3
8. PGP LTL 168*	Technical certainty	Hydrostatic Testing	3
8. PGP LTL 168*	Technical certainty	Status Quo: Modified	2
9. HUS LTL 168*	Prevention of ruptures	ILI Program:	5
9. HUS LTL 168*	Prevention of ruptures	ILI Program - Robotic:	5
9. HUS LTL 168*	Prevention of ruptures	Replacement:	5
9. HUS LTL 168*	Prevention of ruptures	100% Inspection,	5
9. HUS LTL 168*	Prevention of ruptures	Pressure Regulating	5
9. HUS LTL 168*	Prevention of ruptures	Hydrostatic Testing	5
9. HUS LTL 168*	Prevention of ruptures	Status Quo: Modified	2
9. HUS LTL 168*	Prevention of leaks with significant consequences	ILI Program:	5
9. HUS LTL 168*	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
9. HUS LTL 168*	Prevention of leaks with significant consequences	Replacement:	4
9. HUS LTL 168*	Prevention of leaks with significant consequences	100% Inspection,	4
9. HUS LTL 168*	Prevention of leaks with significant consequences	Pressure Regulating	0
9. HUS LTL 168*	Prevention of leaks with significant consequences	Hydrostatic Testing	0
9. HUS LTL 168*	Prevention of leaks with significant consequences	Status Quo: Modified	2
9. HUS LTL 168*	Proactive asset management	ILI Program:	5
9. HUS LTL 168*	Proactive asset management	ILI Program - Robotic:	4
9. HUS LTL 168*	Proactive asset management	Replacement:	4
9. HUS LTL 168*	Proactive asset management	100% Inspection,	2
9. HUS LTL 168*	Proactive asset management	Pressure Regulating	0
9. HUS LTL 168*	Proactive asset management	Hydrostatic Testing	0
9. HUS LTL 168*	Proactive asset management	Status Quo: Modified	1
9. HUS LTL 168*	Technical certainty	ILI Program:	4
9. HUS LTL 168*	Technical certainty	ILI Program - Robotic:	3
9. HUS LTL 168*	Technical certainty	Replacement:	5
9. HUS LTL 168*	Technical certainty	100% Inspection,	4
9. HUS LTL 168*	Technical certainty	Pressure Regulating	3
9. HUS LTL 168*	Technical certainty	Hydrostatic Testing	3
9. HUS LTL 168*	Technical certainty	Status Quo: Modified	2
10. PG2 219 168	Prevention of ruptures	ILI Program:	5
10. PG2 219 168	Prevention of ruptures	ILI Program - Robotic:	5
10. PG2 219 168	Prevention of ruptures	Replacement:	5
10. PG2 219 168	Prevention of ruptures	100% Inspection,	5
10. PG2 219 168	Prevention of ruptures	Pressure Regulating	5
10. PG2 219 168	Prevention of ruptures	Hydrostatic Testing	5
10. PG2 219 168	Prevention of ruptures	Status Quo: Modified	2
10. PG2 219 168	Prevention of leaks with significant consequences	ILI Program:	5
10. PG2 219 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
10. PG2 219 168	Prevention of leaks with significant consequences	Replacement:	4
10. PG2 219 168	Prevention of leaks with significant consequences	100% Inspection,	4
10. PG2 219 168	Prevention of leaks with significant consequences	Pressure Regulating	0
10. PG2 219 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
10. PG2 219 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
10. PG2 219 168	Proactive asset management	ILI Program:	5
10. PG2 219 168	Proactive asset management	ILI Program - Robotic:	4
10. PG2 219 168	Proactive asset management	Replacement:	4
10. PG2 219 168	Proactive asset management	100% Inspection,	2
10. PG2 219 168	Proactive asset management	Pressure Regulating	0
10. PG2 219 168	Proactive asset management	Hydrostatic Testing	0
10. PG2 219 168	Proactive asset management	Status Quo: Modified	1
10. PG2 219 168	Technical certainty	ILI Program:	4
10. PG2 219 168	Technical certainty	ILI Program - Robotic:	3
10. PG2 219 168	Technical certainty	Replacement:	5
10. PG2 219 168	Technical certainty	100% Inspection,	4
10. PG2 219 168	Technical certainty	Pressure Regulating	3
10. PG2 219 168	Technical certainty	Hydrostatic Testing	3
10. PG2 219 168	Technical certainty	Status Quo: Modified	2
11. CAR LTL 168	Prevention of ruptures	ILI Program:	5
11. CAR LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
11. CAR LTL 168	Prevention of ruptures	Replacement:	5
11. CAR LTL 168	Prevention of ruptures	100% Inspection,	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating	0%	3	-	3
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
11. CAR LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
11. CAR LTL 168	Rate impact	ILI Program:		-	0	0
11. CAR LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
11. CAR LTL 168	Rate impact	Replacement:		-	0	0
11. CAR LTL 168	Rate impact	100% Inspection,		-	0	0
11. CAR LTL 168	Rate impact	Pressure Regulating		-	0	0
11. CAR LTL 168	Rate impact	Hydrostatic Testing		-	0	0
11. CAR LTL 168	Rate impact	Status Quo: Modified		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
11. CAR LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	149%	1	-	1
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	653%	1	-	1
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating	0%	5	-	5
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
12. WIL LP1/LP2 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
12. WIL LP1/LP2 168	Rate impact	ILI Program:		-	0	0
12. WIL LP1/LP2 168	Rate impact	ILI Program - Robotic:		-	0	0
12. WIL LP1/LP2 168	Rate impact	Replacement:		-	0	0
12. WIL LP1/LP2 168	Rate impact	100% Inspection,		-	0	0
12. WIL LP1/LP2 168	Rate impact	Pressure Regulating		-	0	0
12. WIL LP1/LP2 168	Rate impact	Hydrostatic Testing		-	0	0
12. WIL LP1/LP2 168	Rate impact	Status Quo: Modified		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	Replacement:		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
12. WIL LP1/LP2 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	117%	2	-	2
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	0%	5	-	5
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
13.1. KA1 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
13.1. KA1 LTL 168	Rate impact	ILI Program:		-	0	0
13.1. KA1 LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
13.1. KA1 LTL 168	Rate impact	Replacement:		-	0	0
13.1. KA1 LTL 168	Rate impact	100% Inspection,		-	0	0
13.1. KA1 LTL 168	Rate impact	Pressure Regulating		-	0	0
13.1. KA1 LTL 168	Rate impact	Hydrostatic Testing		-	0	0
13.1. KA1 LTL 168	Rate impact	Status Quo: Modified		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
13.1. KA1 LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	41%	2	-	2
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	0%	5	-	5
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
13.2. KA1 LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
13.2. KA1 LOP 168	Rate impact	ILI Program:		-	0	0
13.2. KA1 LOP 168	Rate impact	ILI Program - Robotic:		-	0	0
13.2. KA1 LOP 168	Rate impact	Replacement:		-	0	0
13.2. KA1 LOP 168	Rate impact	100% Inspection,		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
11. CAR LTL 168	Prevention of ruptures	**Pressure Regulating**	5
11. CAR LTL 168	Prevention of ruptures	**Hydrostatic Testing**	5
11. CAR LTL 168	Prevention of ruptures	**Status Quo: Modified**	2
11. CAR LTL 168	Prevention of leaks with significant consequences	**ILI Program:**	5
11. CAR LTL 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
11. CAR LTL 168	Prevention of leaks with significant consequences	**Replacement:**	4
11. CAR LTL 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
11. CAR LTL 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
11. CAR LTL 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
11. CAR LTL 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
11. CAR LTL 168	Proactive asset management	**ILI Program:**	5
11. CAR LTL 168	Proactive asset management	**ILI Program - Robotic:**	4
11. CAR LTL 168	Proactive asset management	**Replacement:**	4
11. CAR LTL 168	Proactive asset management	**100% Inspection,**	2
11. CAR LTL 168	Proactive asset management	**Pressure Regulating**	0
11. CAR LTL 168	Proactive asset management	**Hydrostatic Testing**	0
11. CAR LTL 168	Proactive asset management	**Status Quo: Modified**	1
11. CAR LTL 168	Technical certainty	**ILI Program:**	4
11. CAR LTL 168	Technical certainty	**ILI Program - Robotic:**	3
11. CAR LTL 168	Technical certainty	**Replacement:**	5
11. CAR LTL 168	Technical certainty	**100% Inspection,**	4
11. CAR LTL 168	Technical certainty	**Pressure Regulating**	3
11. CAR LTL 168	Technical certainty	**Hydrostatic Testing**	3
11. CAR LTL 168	Technical certainty	**Status Quo: Modified**	2
12. WIL LP1/LP2 168	Prevention of ruptures	**ILI Program:**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**ILI Program - Robotic:**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**Replacement:**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**100% Inspection,**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**Pressure Regulating**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**Hydrostatic Testing**	5
12. WIL LP1/LP2 168	Prevention of ruptures	**Status Quo: Modified**	2
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**ILI Program:**	5
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**Replacement:**	4
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
12. WIL LP1/LP2 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
12. WIL LP1/LP2 168	Proactive asset management	**ILI Program:**	5
12. WIL LP1/LP2 168	Proactive asset management	**ILI Program - Robotic:**	4
12. WIL LP1/LP2 168	Proactive asset management	**Replacement:**	4
12. WIL LP1/LP2 168	Proactive asset management	**100% Inspection,**	2
12. WIL LP1/LP2 168	Proactive asset management	**Pressure Regulating**	0
12. WIL LP1/LP2 168	Proactive asset management	**Hydrostatic Testing**	0
12. WIL LP1/LP2 168	Proactive asset management	**Status Quo: Modified**	1
12. WIL LP1/LP2 168	Technical certainty	**ILI Program:**	4
12. WIL LP1/LP2 168	Technical certainty	**ILI Program - Robotic:**	3
12. WIL LP1/LP2 168	Technical certainty	**Replacement:**	5
12. WIL LP1/LP2 168	Technical certainty	**100% Inspection,**	4
12. WIL LP1/LP2 168	Technical certainty	**Pressure Regulating**	3
12. WIL LP1/LP2 168	Technical certainty	**Hydrostatic Testing**	3
12. WIL LP1/LP2 168	Technical certainty	**Status Quo: Modified**	2
13.1. KA1 LTL 168	Prevention of ruptures	**ILI Program:**	5
13.1. KA1 LTL 168	Prevention of ruptures	**ILI Program - Robotic:**	5
13.1. KA1 LTL 168	Prevention of ruptures	**Replacement:**	5
13.1. KA1 LTL 168	Prevention of ruptures	**100% Inspection,**	5
13.1. KA1 LTL 168	Prevention of ruptures	**Pressure Regulating**	5
13.1. KA1 LTL 168	Prevention of ruptures	**Hydrostatic Testing**	5
13.1. KA1 LTL 168	Prevention of ruptures	**Status Quo: Modified**	2
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**ILI Program:**	5
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**Replacement:**	4
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
13.1. KA1 LTL 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
13.1. KA1 LTL 168	Proactive asset management	**ILI Program:**	5
13.1. KA1 LTL 168	Proactive asset management	**ILI Program - Robotic:**	4
13.1. KA1 LTL 168	Proactive asset management	**Replacement:**	4
13.1. KA1 LTL 168	Proactive asset management	**100% Inspection,**	2
13.1. KA1 LTL 168	Proactive asset management	**Pressure Regulating**	0

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
13.2. KA1 LOP 168	Rate impact	**Pressure Regulating**		-	0	0
13.2. KA1 LOP 168	Rate impact	**Hydrostatic Testing**		-	0	0
13.2. KA1 LOP 168	Rate impact	**Status Quo: Modified**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
13.2. KA1 LOP 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	5	-	5
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	274%	1	-	1
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
14. SAL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
14. SAL LOP 168	Rate impact	**ILI Program:**		-	0	0
14. SAL LOP 168	Rate impact	**ILI Program - Robotic:**		-	0	0
14. SAL LOP 168	Rate impact	**Replacement:**		-	0	0
14. SAL LOP 168	Rate impact	**100% Inspection,**		-	0	0
14. SAL LOP 168	Rate impact	**Pressure Regulating**		-	0	0
14. SAL LOP 168	Rate impact	**Hydrostatic Testing**		-	0	0
14. SAL LOP 168	Rate impact	**Status Quo: Modified**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
14. SAL LOP 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	1	-	1
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	13%	5	-	5
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
15. SA3 LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
15. SA3 LTL 168	Rate impact	**ILI Program:**		-	0	0
15. SA3 LTL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
15. SA3 LTL 168	Rate impact	**Replacement:**		-	0	0
15. SA3 LTL 168	Rate impact	**100% Inspection,**		-	0	0
15. SA3 LTL 168	Rate impact	**Pressure Regulating**		-	0	0
15. SA3 LTL 168	Rate impact	**Hydrostatic Testing**		-	0	0
15. SA3 LTL 168	Rate impact	**Status Quo: Modified**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
15. SA3 LTL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	118%	1	-	1
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	160%	3	-	3
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**	0%	5	-	5
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
16. COL LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
16. COL LTL 219	Rate impact	**ILI Program:**		-	0	0
16. COL LTL 219	Rate impact	**ILI Program - Robotic:**		-	0	0
16. COL LTL 219	Rate impact	**Replacement:**		-	0	0
16. COL LTL 219	Rate impact	**100% Inspection,**		-	0	0
16. COL LTL 219	Rate impact	**Pressure Regulating**		-	0	0
16. COL LTL 219	Rate impact	**Hydrostatic Testing**		-	0	0
16. COL LTL 219	Rate impact	**Status Quo: Modified**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**Replacement:**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
13.1. KA1 LTL 168	Proactive asset management	**Hydrostatic Testing**	0
13.1. KA1 LTL 168	Proactive asset management	**Status Quo: Modified**	1
13.1. KA1 LTL 168	Technical certainty	**ILI Program:**	4
13.1. KA1 LTL 168	Technical certainty	**ILI Program - Robotic:**	3
13.1. KA1 LTL 168	Technical certainty	**Replacement:**	5
13.1. KA1 LTL 168	Technical certainty	**100% Inspection,**	4
13.1. KA1 LTL 168	Technical certainty	**Pressure Regulating**	3
13.1. KA1 LTL 168	Technical certainty	**Hydrostatic Testing**	3
13.1. KA1 LTL 168	Technical certainty	**Status Quo: Modified**	2
13.2. KA1 LOP 168	Prevention of ruptures	**ILI Program:**	5
13.2. KA1 LOP 168	Prevention of ruptures	**ILI Program - Robotic:**	5
13.2. KA1 LOP 168	Prevention of ruptures	**Replacement:**	5
13.2. KA1 LOP 168	Prevention of ruptures	**100% Inspection,**	5
13.2. KA1 LOP 168	Prevention of ruptures	**Pressure Regulating**	5
13.2. KA1 LOP 168	Prevention of ruptures	**Hydrostatic Testing**	5
13.2. KA1 LOP 168	Prevention of ruptures	**Status Quo: Modified**	2
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**ILI Program:**	5
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**Replacement:**	4
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
13.2. KA1 LOP 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
13.2. KA1 LOP 168	Proactive asset management	**ILI Program:**	5
13.2. KA1 LOP 168	Proactive asset management	**ILI Program - Robotic:**	4
13.2. KA1 LOP 168	Proactive asset management	**Replacement:**	4
13.2. KA1 LOP 168	Proactive asset management	**100% Inspection,**	2
13.2. KA1 LOP 168	Proactive asset management	**Pressure Regulating**	0
13.2. KA1 LOP 168	Proactive asset management	**Hydrostatic Testing**	0
13.2. KA1 LOP 168	Proactive asset management	**Status Quo: Modified**	1
13.2. KA1 LOP 168	Technical certainty	**ILI Program:**	4
13.2. KA1 LOP 168	Technical certainty	**ILI Program - Robotic:**	3
13.2. KA1 LOP 168	Technical certainty	**Replacement:**	5
13.2. KA1 LOP 168	Technical certainty	**100% Inspection,**	4
13.2. KA1 LOP 168	Technical certainty	**Pressure Regulating**	3
13.2. KA1 LOP 168	Technical certainty	**Hydrostatic Testing**	3
13.2. KA1 LOP 168	Technical certainty	**Status Quo: Modified**	2
14. SAL LOP 168	Prevention of ruptures	**ILI Program:**	5
14. SAL LOP 168	Prevention of ruptures	**ILI Program - Robotic:**	5
14. SAL LOP 168	Prevention of ruptures	**Replacement:**	5
14. SAL LOP 168	Prevention of ruptures	**100% Inspection,**	5
14. SAL LOP 168	Prevention of ruptures	**Pressure Regulating**	5
14. SAL LOP 168	Prevention of ruptures	**Hydrostatic Testing**	5
14. SAL LOP 168	Prevention of ruptures	**Status Quo: Modified**	2
14. SAL LOP 168	Prevention of leaks with significant consequences	**ILI Program:**	5
14. SAL LOP 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
14. SAL LOP 168	Prevention of leaks with significant consequences	**Replacement:**	4
14. SAL LOP 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
14. SAL LOP 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
14. SAL LOP 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
14. SAL LOP 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
14. SAL LOP 168	Proactive asset management	**ILI Program:**	5
14. SAL LOP 168	Proactive asset management	**ILI Program - Robotic:**	4
14. SAL LOP 168	Proactive asset management	**Replacement:**	4
14. SAL LOP 168	Proactive asset management	**100% Inspection,**	2
14. SAL LOP 168	Proactive asset management	**Pressure Regulating**	0
14. SAL LOP 168	Proactive asset management	**Hydrostatic Testing**	0
14. SAL LOP 168	Proactive asset management	**Status Quo: Modified**	1
14. SAL LOP 168	Technical certainty	**ILI Program:**	4
14. SAL LOP 168	Technical certainty	**ILI Program - Robotic:**	3
14. SAL LOP 168	Technical certainty	**Replacement:**	5
14. SAL LOP 168	Technical certainty	**100% Inspection,**	4
14. SAL LOP 168	Technical certainty	**Pressure Regulating**	3
14. SAL LOP 168	Technical certainty	**Hydrostatic Testing**	3
14. SAL LOP 168	Technical certainty	**Status Quo: Modified**	2
15. SA3 LTL 168	Prevention of ruptures	**ILI Program:**	5
15. SA3 LTL 168	Prevention of ruptures	**ILI Program - Robotic:**	5
15. SA3 LTL 168	Prevention of ruptures	**Replacement:**	5
15. SA3 LTL 168	Prevention of ruptures	**100% Inspection,**	5
15. SA3 LTL 168	Prevention of ruptures	**Pressure Regulating**	5
15. SA3 LTL 168	Prevention of ruptures	**Hydrostatic Testing**	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
16. COL LTL 219	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
16. COL LTL 219	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	169%	1	-	1
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	251%	1	-	1
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**	0%	5	-	5
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
17. COL LOP 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
17. COL LOP 168	Rate impact	**ILI Program:**		-	0	0
17. COL LOP 168	Rate impact	**ILI Program - Robotic:**		-	0	0
17. COL LOP 168	Rate impact	**Replacement:**		-	0	0
17. COL LOP 168	Rate impact	**100% Inspection,**		-	0	0
17. COL LOP 168	Rate impact	**Pressure Regulating**		-	0	0
17. COL LOP 168	Rate impact	**Hydrostatic Testing**		-	0	0
17. COL LOP 168	Rate impact	**Status Quo: Modified**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
17. COL LOP 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	139%	1	-	1
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	193%	3	-	3
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**	0%	5	-	5
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
18. KE1 LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
18. KE1 LOP 219	Rate impact	**ILI Program:**		-	0	0
18. KE1 LOP 219	Rate impact	**ILI Program - Robotic:**		-	0	0
18. KE1 LOP 219	Rate impact	**Replacement:**		-	0	0
18. KE1 LOP 219	Rate impact	**100% Inspection,**		-	0	0
18. KE1 LOP 219	Rate impact	**Pressure Regulating**		-	0	0
18. KE1 LOP 219	Rate impact	**Hydrostatic Testing**		-	0	0
18. KE1 LOP 219	Rate impact	**Status Quo: Modified**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**Replacement:**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
18. KE1 LOP 219	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	2	-	2
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	101%	1	-	1
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
19. CEL LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
19. CEL LTL 168	Rate impact	**ILI Program:**		-	0	0
19. CEL LTL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
19. CEL LTL 168	Rate impact	**Replacement:**		-	0	0
19. CEL LTL 168	Rate impact	**100% Inspection,**		-	0	0
19. CEL LTL 168	Rate impact	**Pressure Regulating**		-	0	0
19. CEL LTL 168	Rate impact	**Hydrostatic Testing**		-	0	0
19. CEL LTL 168	Rate impact	**Status Quo: Modified**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
19. CEL LTL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	1	-	1
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	122%	1	-	1
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
15. SA3 LTL 168	Prevention of ruptures	**Status Quo: Modified**	2
15. SA3 LTL 168	Prevention of leaks with significant consequences	**ILI Program:**	5
15. SA3 LTL 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
15. SA3 LTL 168	Prevention of leaks with significant consequences	**Replacement:**	4
15. SA3 LTL 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
15. SA3 LTL 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
15. SA3 LTL 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
15. SA3 LTL 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
15. SA3 LTL 168	Proactive asset management	**ILI Program:**	5
15. SA3 LTL 168	Proactive asset management	**ILI Program - Robotic:**	4
15. SA3 LTL 168	Proactive asset management	**Replacement:**	4
15. SA3 LTL 168	Proactive asset management	**100% Inspection,**	2
15. SA3 LTL 168	Proactive asset management	**Pressure Regulating**	0
15. SA3 LTL 168	Proactive asset management	**Hydrostatic Testing**	0
15. SA3 LTL 168	Proactive asset management	**Status Quo: Modified**	1
15. SA3 LTL 168	Technical certainty	**ILI Program:**	4
15. SA3 LTL 168	Technical certainty	**ILI Program - Robotic:**	3
15. SA3 LTL 168	Technical certainty	**Replacement:**	5
15. SA3 LTL 168	Technical certainty	**100% Inspection,**	4
15. SA3 LTL 168	Technical certainty	**Pressure Regulating**	3
15. SA3 LTL 168	Technical certainty	**Hydrostatic Testing**	3
15. SA3 LTL 168	Technical certainty	**Status Quo: Modified**	2
16. COL LTL 219	Prevention of ruptures	**ILI Program:**	5
16. COL LTL 219	Prevention of ruptures	**ILI Program - Robotic:**	5
16. COL LTL 219	Prevention of ruptures	**Replacement:**	5
16. COL LTL 219	Prevention of ruptures	**100% Inspection,**	5
16. COL LTL 219	Prevention of ruptures	**Pressure Regulating**	5
16. COL LTL 219	Prevention of ruptures	**Hydrostatic Testing**	5
16. COL LTL 219	Prevention of ruptures	**Status Quo: Modified**	2
16. COL LTL 219	Prevention of leaks with significant consequences	**ILI Program:**	5
16. COL LTL 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
16. COL LTL 219	Prevention of leaks with significant consequences	**Replacement:**	4
16. COL LTL 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
16. COL LTL 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
16. COL LTL 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
16. COL LTL 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
16. COL LTL 219	Proactive asset management	**ILI Program:**	5
16. COL LTL 219	Proactive asset management	**ILI Program - Robotic:**	4
16. COL LTL 219	Proactive asset management	**Replacement:**	4
16. COL LTL 219	Proactive asset management	**100% Inspection,**	2
16. COL LTL 219	Proactive asset management	**Pressure Regulating**	0
16. COL LTL 219	Proactive asset management	**Hydrostatic Testing**	0
16. COL LTL 219	Proactive asset management	**Status Quo: Modified**	1
16. COL LTL 219	Technical certainty	**ILI Program:**	4
16. COL LTL 219	Technical certainty	**ILI Program - Robotic:**	3
16. COL LTL 219	Technical certainty	**Replacement:**	5
16. COL LTL 219	Technical certainty	**100% Inspection,**	4
16. COL LTL 219	Technical certainty	**Pressure Regulating**	3
16. COL LTL 219	Technical certainty	**Hydrostatic Testing**	3
16. COL LTL 219	Technical certainty	**Status Quo: Modified**	2
17. COL LOP 168	Prevention of ruptures	**ILI Program:**	5
17. COL LOP 168	Prevention of ruptures	**ILI Program - Robotic:**	5
17. COL LOP 168	Prevention of ruptures	**Replacement:**	5
17. COL LOP 168	Prevention of ruptures	**100% Inspection,**	5
17. COL LOP 168	Prevention of ruptures	**Pressure Regulating**	5
17. COL LOP 168	Prevention of ruptures	**Hydrostatic Testing**	5
17. COL LOP 168	Prevention of ruptures	**Status Quo: Modified**	2
17. COL LOP 168	Prevention of leaks with significant consequences	**ILI Program:**	5
17. COL LOP 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
17. COL LOP 168	Prevention of leaks with significant consequences	**Replacement:**	4
17. COL LOP 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
17. COL LOP 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
17. COL LOP 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
17. COL LOP 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
17. COL LOP 168	Proactive asset management	**ILI Program:**	5
17. COL LOP 168	Proactive asset management	**ILI Program - Robotic:**	4
17. COL LOP 168	Proactive asset management	**Replacement:**	4
17. COL LOP 168	Proactive asset management	**100% Inspection,**	2
17. COL LOP 168	Proactive asset management	**Pressure Regulating**	0
17. COL LOP 168	Proactive asset management	**Hydrostatic Testing**	0

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
20. CAS NEL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
20. CAS NEL 168	Rate impact	**ILI Program:**		-	0	0
20. CAS NEL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
20. CAS NEL 168	Rate impact	**Replacement:**		-	0	0
20. CAS NEL 168	Rate impact	**100% Inspection,**		-	0	0
20. CAS NEL 168	Rate impact	**Pressure Regulating**		-	0	0
20. CAS NEL 168	Rate impact	**Hydrostatic Testing**		-	0	0
20. CAS NEL 168	Rate impact	**Status Quo: Modified**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
20. CAS NEL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	1	-	1
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	15%	1	-	1
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
21. TRA LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
21. TRA LTL 168	Rate impact	**ILI Program:**		-	0	0
21. TRA LTL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
21. TRA LTL 168	Rate impact	**Replacement:**		-	0	0
21. TRA LTL 168	Rate impact	**100% Inspection,**		-	0	0
21. TRA LTL 168	Rate impact	**Pressure Regulating**		-	0	0
21. TRA LTL 168	Rate impact	**Hydrostatic Testing**		-	0	0
21. TRA LTL 168	Rate impact	**Status Quo: Modified**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
21. TRA LTL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	5	-	5
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	28%	1	-	1
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**		0	-	0
22. FRD LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
22. FRD LTL 219	Rate impact	**ILI Program:**		-	0	0
22. FRD LTL 219	Rate impact	**ILI Program - Robotic:**		-	0	0
22. FRD LTL 219	Rate impact	**Replacement:**		-	0	0
22. FRD LTL 219	Rate impact	**100% Inspection,**		-	0	0
22. FRD LTL 219	Rate impact	**Pressure Regulating**		-	0	0
22. FRD LTL 219	Rate impact	**Hydrostatic Testing**		-	0	0
22. FRD LTL 219	Rate impact	**Status Quo: Modified**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**Replacement:**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
22. FRD LTL 219	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	2	-	2
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	35%	5	-	5
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		5	-	5
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**	278%	0	-	0
23. ELK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
23. ELK LTL 168	Rate impact	**ILI Program:**		-	0	0
23. ELK LTL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
23. ELK LTL 168	Rate impact	**Replacement:**		-	0	0
23. ELK LTL 168	Rate impact	**100% Inspection,**		-	0	0
23. ELK LTL 168	Rate impact	**Pressure Regulating**		-	0	0
23. ELK LTL 168	Rate impact	**Hydrostatic Testing**		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
17. COL LOP 168	Proactive asset management	**Status Quo: Modified**	1
17. COL LOP 168	Technical certainty	**ILI Program:**	4
17. COL LOP 168	Technical certainty	**ILI Program - Robotic:**	3
17. COL LOP 168	Technical certainty	**Replacement:**	5
17. COL LOP 168	Technical certainty	**100% Inspection,**	4
17. COL LOP 168	Technical certainty	**Pressure Regulating**	3
17. COL LOP 168	Technical certainty	**Hydrostatic Testing**	3
17. COL LOP 168	Technical certainty	**Status Quo: Modified**	2
18. KE1 LOP 219	Prevention of ruptures	**ILI Program:**	5
18. KE1 LOP 219	Prevention of ruptures	**ILI Program - Robotic:**	5
18. KE1 LOP 219	Prevention of ruptures	**Replacement:**	5
18. KE1 LOP 219	Prevention of ruptures	**100% Inspection,**	5
18. KE1 LOP 219	Prevention of ruptures	**Pressure Regulating**	5
18. KE1 LOP 219	Prevention of ruptures	**Hydrostatic Testing**	5
18. KE1 LOP 219	Prevention of ruptures	**Status Quo: Modified**	2
18. KE1 LOP 219	Prevention of leaks with significant consequences	**ILI Program:**	5
18. KE1 LOP 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
18. KE1 LOP 219	Prevention of leaks with significant consequences	**Replacement:**	4
18. KE1 LOP 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
18. KE1 LOP 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
18. KE1 LOP 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
18. KE1 LOP 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
18. KE1 LOP 219	Proactive asset management	**ILI Program:**	5
18. KE1 LOP 219	Proactive asset management	**ILI Program - Robotic:**	4
18. KE1 LOP 219	Proactive asset management	**Replacement:**	4
18. KE1 LOP 219	Proactive asset management	**100% Inspection,**	2
18. KE1 LOP 219	Proactive asset management	**Pressure Regulating**	0
18. KE1 LOP 219	Proactive asset management	**Hydrostatic Testing**	0
18. KE1 LOP 219	Proactive asset management	**Status Quo: Modified**	1
18. KE1 LOP 219	Technical certainty	**ILI Program:**	4
18. KE1 LOP 219	Technical certainty	**ILI Program - Robotic:**	3
18. KE1 LOP 219	Technical certainty	**Replacement:**	5
18. KE1 LOP 219	Technical certainty	**100% Inspection,**	4
18. KE1 LOP 219	Technical certainty	**Pressure Regulating**	3
18. KE1 LOP 219	Technical certainty	**Hydrostatic Testing**	3
18. KE1 LOP 219	Technical certainty	**Status Quo: Modified**	2
19. CEL LTL 168	Prevention of ruptures	**ILI Program:**	5
19. CEL LTL 168	Prevention of ruptures	**ILI Program - Robotic:**	5
19. CEL LTL 168	Prevention of ruptures	**Replacement:**	5
19. CEL LTL 168	Prevention of ruptures	**100% Inspection,**	5
19. CEL LTL 168	Prevention of ruptures	**Pressure Regulating**	5
19. CEL LTL 168	Prevention of ruptures	**Hydrostatic Testing**	5
19. CEL LTL 168	Prevention of ruptures	**Status Quo: Modified**	2
19. CEL LTL 168	Prevention of leaks with significant consequences	**ILI Program:**	5
19. CEL LTL 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
19. CEL LTL 168	Prevention of leaks with significant consequences	**Replacement:**	4
19. CEL LTL 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
19. CEL LTL 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
19. CEL LTL 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
19. CEL LTL 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
19. CEL LTL 168	Proactive asset management	**ILI Program:**	5
19. CEL LTL 168	Proactive asset management	**ILI Program - Robotic:**	4
19. CEL LTL 168	Proactive asset management	**Replacement:**	4
19. CEL LTL 168	Proactive asset management	**100% Inspection,**	2
19. CEL LTL 168	Proactive asset management	**Pressure Regulating**	0
19. CEL LTL 168	Proactive asset management	**Hydrostatic Testing**	0
19. CEL LTL 168	Proactive asset management	**Status Quo: Modified**	1
19. CEL LTL 168	Technical certainty	**ILI Program:**	4
19. CEL LTL 168	Technical certainty	**ILI Program - Robotic:**	3
19. CEL LTL 168	Technical certainty	**Replacement:**	5
19. CEL LTL 168	Technical certainty	**100% Inspection,**	4
19. CEL LTL 168	Technical certainty	**Pressure Regulating**	3
19. CEL LTL 168	Technical certainty	**Hydrostatic Testing**	3
19. CEL LTL 168	Technical certainty	**Status Quo: Modified**	2
20. CAS NEL 168	Prevention of ruptures	**ILI Program:**	5
20. CAS NEL 168	Prevention of ruptures	**ILI Program - Robotic:**	5
20. CAS NEL 168	Prevention of ruptures	**Replacement:**	5
20. CAS NEL 168	Prevention of ruptures	**100% Inspection,**	5
20. CAS NEL 168	Prevention of ruptures	**Pressure Regulating**	5
20. CAS NEL 168	Prevention of ruptures	**Hydrostatic Testing**	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
23. ELK LTL 168	Rate impact	**Status Quo: Modified**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
23. ELK LTL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	5	-	5
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	153%	1	-	1
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**	5%	0	-	0
24. CRK LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
24. CRK LTL 168	Rate impact	**ILI Program:**		-	0	0
24. CRK LTL 168	Rate impact	**ILI Program - Robotic:**		-	0	0
24. CRK LTL 168	Rate impact	**Replacement:**		-	0	0
24. CRK LTL 168	Rate impact	**100% Inspection,**		-	0	0
24. CRK LTL 168	Rate impact	**Pressure Regulating**		-	0	0
24. CRK LTL 168	Rate impact	**Hydrostatic Testing**		-	0	0
24. CRK LTL 168	Rate impact	**Status Quo: Modified**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**Replacement:**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
24. CRK LTL 168	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	5	-	5
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	179%	1	-	1
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**	126%	0	-	0
25. CRK LOP 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
25. CRK LOP 219	Rate impact	**ILI Program:**		-	0	0
25. CRK LOP 219	Rate impact	**ILI Program - Robotic:**		-	0	0
25. CRK LOP 219	Rate impact	**Replacement:**		-	0	0
25. CRK LOP 219	Rate impact	**100% Inspection,**		-	0	0
25. CRK LOP 219	Rate impact	**Pressure Regulating**		-	0	0
25. CRK LOP 219	Rate impact	**Hydrostatic Testing**		-	0	0
25. CRK LOP 219	Rate impact	**Status Quo: Modified**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**Replacement:**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0
25. CRK LOP 219	Retirement of under-depreciated asset	**Status Quo: Modified**		-	0	0
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program:**	0%	5	-	5
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**ILI Program - Robotic:**		0	-	0
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Replacement:**	74%	1	-	1
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**100% Inspection,**		0	-	0
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Pressure Regulating**		0	-	0
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Hydrostatic Testing**	13%	0	-	0
26. CRK LP2 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	**Status Quo: Modified**				
26. CRK LP2 219	Rate impact	**ILI Program:**		-	0	0
26. CRK LP2 219	Rate impact	**ILI Program - Robotic:**		-	0	0
26. CRK LP2 219	Rate impact	**Replacement:**		-	0	0
26. CRK LP2 219	Rate impact	**100% Inspection,**		-	0	0
26. CRK LP2 219	Rate impact	**Pressure Regulating**		-	0	0
26. CRK LP2 219	Rate impact	**Hydrostatic Testing**		-	0	0
26. CRK LP2 219	Rate impact	**Status Quo: Modified**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**ILI Program:**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**ILI Program - Robotic:**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**Replacement:**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**100% Inspection,**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**Pressure Regulating**		-	0	0
26. CRK LP2 219	Retirement of under-depreciated asset	**Hydrostatic Testing**		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
20. CAS NEL 168	Prevention of ruptures	Status Quo: Modified	2
20. CAS NEL 168	Prevention of leaks with significant consequences	ILI Program:	5
20. CAS NEL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
20. CAS NEL 168	Prevention of leaks with significant consequences	Replacement:	4
20. CAS NEL 168	Prevention of leaks with significant consequences	100% Inspection,	4
20. CAS NEL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
20. CAS NEL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
20. CAS NEL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
20. CAS NEL 168	Proactive asset management	ILI Program:	5
20. CAS NEL 168	Proactive asset management	ILI Program - Robotic:	4
20. CAS NEL 168	Proactive asset management	Replacement:	4
20. CAS NEL 168	Proactive asset management	100% Inspection,	2
20. CAS NEL 168	Proactive asset management	Pressure Regulating	0
20. CAS NEL 168	Proactive asset management	Hydrostatic Testing	0
20. CAS NEL 168	Proactive asset management	Status Quo: Modified	1
20. CAS NEL 168	Technical certainty	ILI Program:	4
20. CAS NEL 168	Technical certainty	ILI Program - Robotic:	3
20. CAS NEL 168	Technical certainty	Replacement:	5
20. CAS NEL 168	Technical certainty	100% Inspection,	4
20. CAS NEL 168	Technical certainty	Pressure Regulating	3
20. CAS NEL 168	Technical certainty	Hydrostatic Testing	3
20. CAS NEL 168	Technical certainty	Status Quo: Modified	2
21. TRA LTL 168	Prevention of ruptures	ILI Program:	5
21. TRA LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
21. TRA LTL 168	Prevention of ruptures	Replacement:	5
21. TRA LTL 168	Prevention of ruptures	100% Inspection,	5
21. TRA LTL 168	Prevention of ruptures	Pressure Regulating	5
21. TRA LTL 168	Prevention of ruptures	Hydrostatic Testing	5
21. TRA LTL 168	Prevention of ruptures	Status Quo: Modified	2
21. TRA LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
21. TRA LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
21. TRA LTL 168	Prevention of leaks with significant consequences	Replacement:	4
21. TRA LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
21. TRA LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
21. TRA LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
21. TRA LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
21. TRA LTL 168	Proactive asset management	ILI Program:	5
21. TRA LTL 168	Proactive asset management	ILI Program - Robotic:	4
21. TRA LTL 168	Proactive asset management	Replacement:	4
21. TRA LTL 168	Proactive asset management	100% Inspection,	2
21. TRA LTL 168	Proactive asset management	Pressure Regulating	0
21. TRA LTL 168	Proactive asset management	Hydrostatic Testing	0
21. TRA LTL 168	Proactive asset management	Status Quo: Modified	1
21. TRA LTL 168	Technical certainty	ILI Program:	4
21. TRA LTL 168	Technical certainty	ILI Program - Robotic:	3
21. TRA LTL 168	Technical certainty	Replacement:	5
21. TRA LTL 168	Technical certainty	100% Inspection,	4
21. TRA LTL 168	Technical certainty	Pressure Regulating	3
21. TRA LTL 168	Technical certainty	Hydrostatic Testing	3
21. TRA LTL 168	Technical certainty	Status Quo: Modified	2
22. FRD LTL 219	Prevention of ruptures	ILI Program:	5
22. FRD LTL 219	Prevention of ruptures	ILI Program - Robotic:	5
22. FRD LTL 219	Prevention of ruptures	Replacement:	5
22. FRD LTL 219	Prevention of ruptures	100% Inspection,	5
22. FRD LTL 219	Prevention of ruptures	Pressure Regulating	5
22. FRD LTL 219	Prevention of ruptures	Hydrostatic Testing	5
22. FRD LTL 219	Prevention of ruptures	Status Quo: Modified	2
22. FRD LTL 219	Prevention of leaks with significant consequences	ILI Program:	5
22. FRD LTL 219	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
22. FRD LTL 219	Prevention of leaks with significant consequences	Replacement:	4
22. FRD LTL 219	Prevention of leaks with significant consequences	100% Inspection,	4
22. FRD LTL 219	Prevention of leaks with significant consequences	Pressure Regulating	0
22. FRD LTL 219	Prevention of leaks with significant consequences	Hydrostatic Testing	0
22. FRD LTL 219	Prevention of leaks with significant consequences	Status Quo: Modified	2
22. FRD LTL 219	Proactive asset management	ILI Program:	5
22. FRD LTL 219	Proactive asset management	ILI Program - Robotic:	4
22. FRD LTL 219	Proactive asset management	Replacement:	4
22. FRD LTL 219	Proactive asset management	100% Inspection,	2
22. FRD LTL 219	Proactive asset management	Pressure Regulating	0
22. FRD LTL 219	Proactive asset management	Hydrostatic Testing	0
22. FRD LTL 219	Proactive asset management	Status Quo: Modified	1

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores
26. CRK LP2 219	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	205%	1	-	1
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
27. CRK LOP 273	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
27. CRK LOP 273	Rate impact	ILI Program:		-	0	0
27. CRK LOP 273	Rate impact	ILI Program - Robotic:		-	0	0
27. CRK LOP 273	Rate impact	Replacement:		-	0	0
27. CRK LOP 273	Rate impact	100% Inspection,		-	0	0
27. CRK LOP 273	Rate impact	Pressure Regulating		-	0	0
27. CRK LOP 273	Rate impact	Hydrostatic Testing		-	0	0
27. CRK LOP 273	Rate impact	Status Quo: Modified		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	ILI Program:		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	Replacement:		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	100% Inspection,		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
27. CRK LOP 273	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	54%	1	-	1
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
28. KBY LTL 168	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
28. KBY LTL 168	Rate impact	ILI Program:		-	0	0
28. KBY LTL 168	Rate impact	ILI Program - Robotic:		-	0	0
28. KBY LTL 168	Rate impact	Replacement:		-	0	0
28. KBY LTL 168	Rate impact	100% Inspection,		-	0	0
28. KBY LTL 168	Rate impact	Pressure Regulating		-	0	0
28. KBY LTL 168	Rate impact	Hydrostatic Testing		-	0	0
28. KBY LTL 168	Rate impact	Status Quo: Modified		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	ILI Program:		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	Replacement:		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	100% Inspection,		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
28. KBY LTL 168	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program:	0%	5	-	5
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	ILI Program - Robotic:		0	-	0
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Replacement:	624%	1	-	1
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	100% Inspection,		0	-	0
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Pressure Regulating		0	-	0
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Hydrostatic Testing		0	-	0
29. SSK LTL 219	Net Present Value (50 year) of Capital, O&M, and Retirement Cost	Status Quo: Modified				
29. SSK LTL 219	Rate impact	ILI Program:		-	0	0
29. SSK LTL 219	Rate impact	ILI Program - Robotic:		-	0	0
29. SSK LTL 219	Rate impact	Replacement:		-	0	0
29. SSK LTL 219	Rate impact	100% Inspection,		-	0	0
29. SSK LTL 219	Rate impact	Pressure Regulating		-	0	0
29. SSK LTL 219	Rate impact	Hydrostatic Testing		-	0	0
29. SSK LTL 219	Rate impact	Status Quo: Modified		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	ILI Program:		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	ILI Program - Robotic:		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	Replacement:		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	100% Inspection,		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	Pressure Regulating		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	Hydrostatic Testing		-	0	0
29. SSK LTL 219	Retirement of under-depreciated asset	Status Quo: Modified		-	0	0

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
22. FRD LTL 219	Technical certainty	ILI Program:	4
22. FRD LTL 219	Technical certainty	ILI Program - Robotic:	3
22. FRD LTL 219	Technical certainty	Replacement:	5
22. FRD LTL 219	Technical certainty	100% Inspection,	4
22. FRD LTL 219	Technical certainty	Pressure Regulating	3
22. FRD LTL 219	Technical certainty	Hydrostatic Testing	3
22. FRD LTL 219	Technical certainty	Status Quo: Modified	2
23. ELK LTL 168	Prevention of ruptures	ILI Program:	5
23. ELK LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
23. ELK LTL 168	Prevention of ruptures	Replacement:	5
23. ELK LTL 168	Prevention of ruptures	100% Inspection,	5
23. ELK LTL 168	Prevention of ruptures	Pressure Regulating	5
23. ELK LTL 168	Prevention of ruptures	Hydrostatic Testing	5
23. ELK LTL 168	Prevention of ruptures	Status Quo: Modified	2
23. ELK LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
23. ELK LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
23. ELK LTL 168	Prevention of leaks with significant consequences	Replacement:	4
23. ELK LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
23. ELK LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
23. ELK LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
23. ELK LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
23. ELK LTL 168	Proactive asset management	ILI Program:	5
23. ELK LTL 168	Proactive asset management	ILI Program - Robotic:	4
23. ELK LTL 168	Proactive asset management	Replacement:	4
23. ELK LTL 168	Proactive asset management	100% Inspection,	2
23. ELK LTL 168	Proactive asset management	Pressure Regulating	0
23. ELK LTL 168	Proactive asset management	Hydrostatic Testing	0
23. ELK LTL 168	Proactive asset management	Status Quo: Modified	1
23. ELK LTL 168	Technical certainty	ILI Program:	4
23. ELK LTL 168	Technical certainty	ILI Program - Robotic:	3
23. ELK LTL 168	Technical certainty	Replacement:	5
23. ELK LTL 168	Technical certainty	100% Inspection,	4
23. ELK LTL 168	Technical certainty	Pressure Regulating	3
23. ELK LTL 168	Technical certainty	Hydrostatic Testing	3
23. ELK LTL 168	Technical certainty	Status Quo: Modified	2
24. CRK LTL 168	Prevention of ruptures	ILI Program:	5
24. CRK LTL 168	Prevention of ruptures	ILI Program - Robotic:	5
24. CRK LTL 168	Prevention of ruptures	Replacement:	5
24. CRK LTL 168	Prevention of ruptures	100% Inspection,	5
24. CRK LTL 168	Prevention of ruptures	Pressure Regulating	5
24. CRK LTL 168	Prevention of ruptures	Hydrostatic Testing	5
24. CRK LTL 168	Prevention of ruptures	Status Quo: Modified	2
24. CRK LTL 168	Prevention of leaks with significant consequences	ILI Program:	5
24. CRK LTL 168	Prevention of leaks with significant consequences	ILI Program - Robotic:	5
24. CRK LTL 168	Prevention of leaks with significant consequences	Replacement:	4
24. CRK LTL 168	Prevention of leaks with significant consequences	100% Inspection,	4
24. CRK LTL 168	Prevention of leaks with significant consequences	Pressure Regulating	0
24. CRK LTL 168	Prevention of leaks with significant consequences	Hydrostatic Testing	0
24. CRK LTL 168	Prevention of leaks with significant consequences	Status Quo: Modified	2
24. CRK LTL 168	Proactive asset management	ILI Program:	5
24. CRK LTL 168	Proactive asset management	ILI Program - Robotic:	4
24. CRK LTL 168	Proactive asset management	Replacement:	4
24. CRK LTL 168	Proactive asset management	100% Inspection,	2
24. CRK LTL 168	Proactive asset management	Pressure Regulating	0
24. CRK LTL 168	Proactive asset management	Hydrostatic Testing	0
24. CRK LTL 168	Proactive asset management	Status Quo: Modified	1
24. CRK LTL 168	Technical certainty	ILI Program:	4
24. CRK LTL 168	Technical certainty	ILI Program - Robotic:	3
24. CRK LTL 168	Technical certainty	Replacement:	5
24. CRK LTL 168	Technical certainty	100% Inspection,	4
24. CRK LTL 168	Technical certainty	Pressure Regulating	3
24. CRK LTL 168	Technical certainty	Hydrostatic Testing	3
24. CRK LTL 168	Technical certainty	Status Quo: Modified	2
25. CRK LOP 219	Prevention of ruptures	ILI Program:	5
25. CRK LOP 219	Prevention of ruptures	ILI Program - Robotic:	5
25. CRK LOP 219	Prevention of ruptures	Replacement:	5
25. CRK LOP 219	Prevention of ruptures	100% Inspection,	5
25. CRK LOP 219	Prevention of ruptures	Pressure Regulating	5
25. CRK LOP 219	Prevention of ruptures	Hydrostatic Testing	5
25. CRK LOP 219	Prevention of ruptures	Status Quo: Modified	2
25. CRK LOP 219	Prevention of leaks with significant consequences	ILI Program:	5

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
25. CRK LOP 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
25. CRK LOP 219	Prevention of leaks with significant consequences	**Replacement:**	4
25. CRK LOP 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
25. CRK LOP 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
25. CRK LOP 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
25. CRK LOP 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
25. CRK LOP 219	Proactive asset management	**ILI Program:**	5
25. CRK LOP 219	Proactive asset management	**ILI Program - Robotic:**	4
25. CRK LOP 219	Proactive asset management	**Replacement:**	4
25. CRK LOP 219	Proactive asset management	**100% Inspection,**	2
25. CRK LOP 219	Proactive asset management	**Pressure Regulating**	0
25. CRK LOP 219	Proactive asset management	**Hydrostatic Testing**	0
25. CRK LOP 219	Proactive asset management	**Status Quo: Modified**	1
25. CRK LOP 219	Technical certainty	**ILI Program:**	4
25. CRK LOP 219	Technical certainty	**ILI Program - Robotic:**	3
25. CRK LOP 219	Technical certainty	**Replacement:**	5
25. CRK LOP 219	Technical certainty	**100% Inspection,**	4
25. CRK LOP 219	Technical certainty	**Pressure Regulating**	3
25. CRK LOP 219	Technical certainty	**Hydrostatic Testing**	3
25. CRK LOP 219	Technical certainty	**Status Quo: Modified**	2
26. CRK LP2 219	Prevention of ruptures	**ILI Program:**	5
26. CRK LP2 219	Prevention of ruptures	**ILI Program - Robotic:**	5
26. CRK LP2 219	Prevention of ruptures	**Replacement:**	5
26. CRK LP2 219	Prevention of ruptures	**100% Inspection,**	5
26. CRK LP2 219	Prevention of ruptures	**Pressure Regulating**	5
26. CRK LP2 219	Prevention of ruptures	**Hydrostatic Testing**	5
26. CRK LP2 219	Prevention of ruptures	**Status Quo: Modified**	2
26. CRK LP2 219	Prevention of leaks with significant consequences	**ILI Program:**	5
26. CRK LP2 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
26. CRK LP2 219	Prevention of leaks with significant consequences	**Replacement:**	4
26. CRK LP2 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
26. CRK LP2 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
26. CRK LP2 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
26. CRK LP2 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
26. CRK LP2 219	Proactive asset management	**ILI Program:**	5
26. CRK LP2 219	Proactive asset management	**ILI Program - Robotic:**	4
26. CRK LP2 219	Proactive asset management	**Replacement:**	4
26. CRK LP2 219	Proactive asset management	**100% Inspection,**	2
26. CRK LP2 219	Proactive asset management	**Pressure Regulating**	0
26. CRK LP2 219	Proactive asset management	**Hydrostatic Testing**	0
26. CRK LP2 219	Proactive asset management	**Status Quo: Modified**	1
26. CRK LP2 219	Technical certainty	**ILI Program:**	4
26. CRK LP2 219	Technical certainty	**ILI Program - Robotic:**	3
26. CRK LP2 219	Technical certainty	**Replacement:**	5
26. CRK LP2 219	Technical certainty	**100% Inspection,**	4
26. CRK LP2 219	Technical certainty	**Pressure Regulating**	3
26. CRK LP2 219	Technical certainty	**Hydrostatic Testing**	3
26. CRK LP2 219	Technical certainty	**Status Quo: Modified**	2
27. CRK LOP 273	Prevention of ruptures	**ILI Program:**	5
27. CRK LOP 273	Prevention of ruptures	**ILI Program - Robotic:**	5
27. CRK LOP 273	Prevention of ruptures	**Replacement:**	5
27. CRK LOP 273	Prevention of ruptures	**100% Inspection,**	5
27. CRK LOP 273	Prevention of ruptures	**Pressure Regulating**	5
27. CRK LOP 273	Prevention of ruptures	**Hydrostatic Testing**	5
27. CRK LOP 273	Prevention of ruptures	**Status Quo: Modified**	2
27. CRK LOP 273	Prevention of leaks with significant consequences	**ILI Program:**	5
27. CRK LOP 273	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
27. CRK LOP 273	Prevention of leaks with significant consequences	**Replacement:**	4
27. CRK LOP 273	Prevention of leaks with significant consequences	**100% Inspection,**	4
27. CRK LOP 273	Prevention of leaks with significant consequences	**Pressure Regulating**	0
27. CRK LOP 273	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
27. CRK LOP 273	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
27. CRK LOP 273	Proactive asset management	**ILI Program:**	5
27. CRK LOP 273	Proactive asset management	**ILI Program - Robotic:**	4
27. CRK LOP 273	Proactive asset management	**Replacement:**	4
27. CRK LOP 273	Proactive asset management	**100% Inspection,**	2
27. CRK LOP 273	Proactive asset management	**Pressure Regulating**	0
27. CRK LOP 273	Proactive asset management	**Hydrostatic Testing**	0
27. CRK LOP 273	Proactive asset management	**Status Quo: Modified**	1
27. CRK LOP 273	Technical certainty	**ILI Program:**	4
27. CRK LOP 273	Technical certainty	**ILI Program - Robotic:**	3

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores

Technical			
Lateral	Category	Alternative Evaluation Criteria	Scores
27. CRK LOP 273	Technical certainty	**Replacement:**	5
27. CRK LOP 273	Technical certainty	**100% Inspection,**	4
27. CRK LOP 273	Technical certainty	**Pressure Regulating**	3
27. CRK LOP 273	Technical certainty	**Hydrostatic Testing**	3
27. CRK LOP 273	Technical certainty	**Status Quo: Modified**	2
28. KBY LTL 168	Prevention of ruptures	**ILI Program:**	5
28. KBY LTL 168	Prevention of ruptures	**ILI Program - Robotic:**	5
28. KBY LTL 168	Prevention of ruptures	**Replacement:**	5
28. KBY LTL 168	Prevention of ruptures	**100% Inspection,**	5
28. KBY LTL 168	Prevention of ruptures	**Pressure Regulating**	5
28. KBY LTL 168	Prevention of ruptures	**Hydrostatic Testing**	5
28. KBY LTL 168	Prevention of ruptures	**Status Quo: Modified**	2
28. KBY LTL 168	Prevention of leaks with significant consequences	**ILI Program:**	5
28. KBY LTL 168	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
28. KBY LTL 168	Prevention of leaks with significant consequences	**Replacement:**	4
28. KBY LTL 168	Prevention of leaks with significant consequences	**100% Inspection,**	4
28. KBY LTL 168	Prevention of leaks with significant consequences	**Pressure Regulating**	0
28. KBY LTL 168	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
28. KBY LTL 168	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
28. KBY LTL 168	Proactive asset management	**ILI Program:**	5
28. KBY LTL 168	Proactive asset management	**ILI Program - Robotic:**	4
28. KBY LTL 168	Proactive asset management	**Replacement:**	4
28. KBY LTL 168	Proactive asset management	**100% Inspection,**	2
28. KBY LTL 168	Proactive asset management	**Pressure Regulating**	0
28. KBY LTL 168	Proactive asset management	**Hydrostatic Testing**	0
28. KBY LTL 168	Proactive asset management	**Status Quo: Modified**	1
28. KBY LTL 168	Technical certainty	**ILI Program:**	4
28. KBY LTL 168	Technical certainty	**ILI Program - Robotic:**	3
28. KBY LTL 168	Technical certainty	**Replacement:**	5
28. KBY LTL 168	Technical certainty	**100% Inspection,**	4
28. KBY LTL 168	Technical certainty	**Pressure Regulating**	3
28. KBY LTL 168	Technical certainty	**Hydrostatic Testing**	3
28. KBY LTL 168	Technical certainty	**Status Quo: Modified**	2
29. SSK LTL 219	Prevention of ruptures	**ILI Program:**	5
29. SSK LTL 219	Prevention of ruptures	**ILI Program - Robotic:**	5
29. SSK LTL 219	Prevention of ruptures	**Replacement:**	5
29. SSK LTL 219	Prevention of ruptures	**100% Inspection,**	5
29. SSK LTL 219	Prevention of ruptures	**Pressure Regulating**	5
29. SSK LTL 219	Prevention of ruptures	**Hydrostatic Testing**	5
29. SSK LTL 219	Prevention of ruptures	**Status Quo: Modified**	2
29. SSK LTL 219	Prevention of leaks with significant consequences	**ILI Program:**	5
29. SSK LTL 219	Prevention of leaks with significant consequences	**ILI Program - Robotic:**	5
29. SSK LTL 219	Prevention of leaks with significant consequences	**Replacement:**	4
29. SSK LTL 219	Prevention of leaks with significant consequences	**100% Inspection,**	4
29. SSK LTL 219	Prevention of leaks with significant consequences	**Pressure Regulating**	0
29. SSK LTL 219	Prevention of leaks with significant consequences	**Hydrostatic Testing**	0
29. SSK LTL 219	Prevention of leaks with significant consequences	**Status Quo: Modified**	2
29. SSK LTL 219	Proactive asset management	**ILI Program:**	5
29. SSK LTL 219	Proactive asset management	**ILI Program - Robotic:**	4
29. SSK LTL 219	Proactive asset management	**Replacement:**	4
29. SSK LTL 219	Proactive asset management	**100% Inspection,**	2
29. SSK LTL 219	Proactive asset management	**Pressure Regulating**	0
29. SSK LTL 219	Proactive asset management	**Hydrostatic Testing**	0
29. SSK LTL 219	Proactive asset management	**Status Quo: Modified**	1
29. SSK LTL 219	Technical certainty	**ILI Program:**	4
29. SSK LTL 219	Technical certainty	**ILI Program - Robotic:**	3
29. SSK LTL 219	Technical certainty	**Replacement:**	5
29. SSK LTL 219	Technical certainty	**100% Inspection,**	4
29. SSK LTL 219	Technical certainty	**Pressure Regulating**	3
29. SSK LTL 219	Technical certainty	**Hydrostatic Testing**	3
29. SSK LTL 219	Technical certainty	**Status Quo: Modified**	2

Financial						
Lateral	Category	Alternative Evaluation Criteria	Cost increase (%)	Scores (Net)	scores (Rate impact & Retirement)	Scores

Appendix J

STANTEC FEED REPORT DOCUMENTS

FILED CONFIDENTIALLY

Appendix J-1

STANTEC FEED REPORT

FILED CONFIDENTIALLY

Appendix J-2

ILI BASIS OF ESTIMATE

FILED CONFIDENTIALLY

Appendix J-3

PRS BASIS OF ESTIMATE

FILED CONFIDENTIALLY

Appendix J-4

PLR BASIS OF ESTIMATE

FILED CONFIDENTIALLY

Appendix K

TECHNICAL DESCRIPTION OF PROPOSED WORK FOR EACH LATERAL ALTERNATIVE

1.1 TECHNICAL DESCRIPTION OF PROPOSED WORK FOR EACH LATERAL DESCRIPTION OF TRANSMISSION LATERALS WITH ILI AS PREFERRED ALTERNATIVE

There are a total of 11 lateral systems where an upgrade to perform ILI was the preferred alternative. Below is a detailed Project description for each lateral system with the required upgrades discussed in Section 5.2.1.

1.1.1 Lateral 1 – Mackenzie Lateral 168 (MAC LTL 168)

The MAC LTL 168, identified as Lateral 1 for this Project, has ILI selected as the preferred alternative.

1.1.1.1 *Existing System*

The NPS 6 diameter, 28,678 metres long MAC LTL 168 branches off the Enbridge (formerly Westcoast Energy/Spectra) system, near the town of Mackenzie, BC. At this take-off location, there is an existing facility called the Mackenzie Tap Odorant Station. The Mackenzie Lateral 168 shares right of way (ROW) with the MAC LOP 168/219 from Kilometre Post (KP) 0+000[1] to KP 12+026 as well as from KP 12+710 to KP 14+743. At the crossing of the Mischinsinlika Creek, both the MAC LTL 168 and the MAC LOP 168/219 join to share a common NPS 8 Horizontal directional drill (HDD) crossing then diverge again.

Table K-1: Existing MAC LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	12+264	NPS 6	1966
12+264	12+716	NPS 8 (Mischinsinlika Creek HDD)	2007
12+716	28+678	NPS 6	1966
28+678	31+851	NPS 3 (not in Project scope)	1966

1.1.1.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on MAC LTL 168 require upgrade in order for the lateral to become ILI capable. The MAC LTL 168 upgrade requirements are indicated in Table K-2.

[1] Kilometre post format is as follows: X+YYY where X is the number of kilometres from the starting post 0+000, and YYY represents the number of meters from kilometer post X. For example, 12+026 would mean 12 kilometers and 26 meters further from the 12th kilometer post.

The Control Valve Assembly (CVA) to be installed will service both MAC LTL 168 and the MAC LOP 168/219.

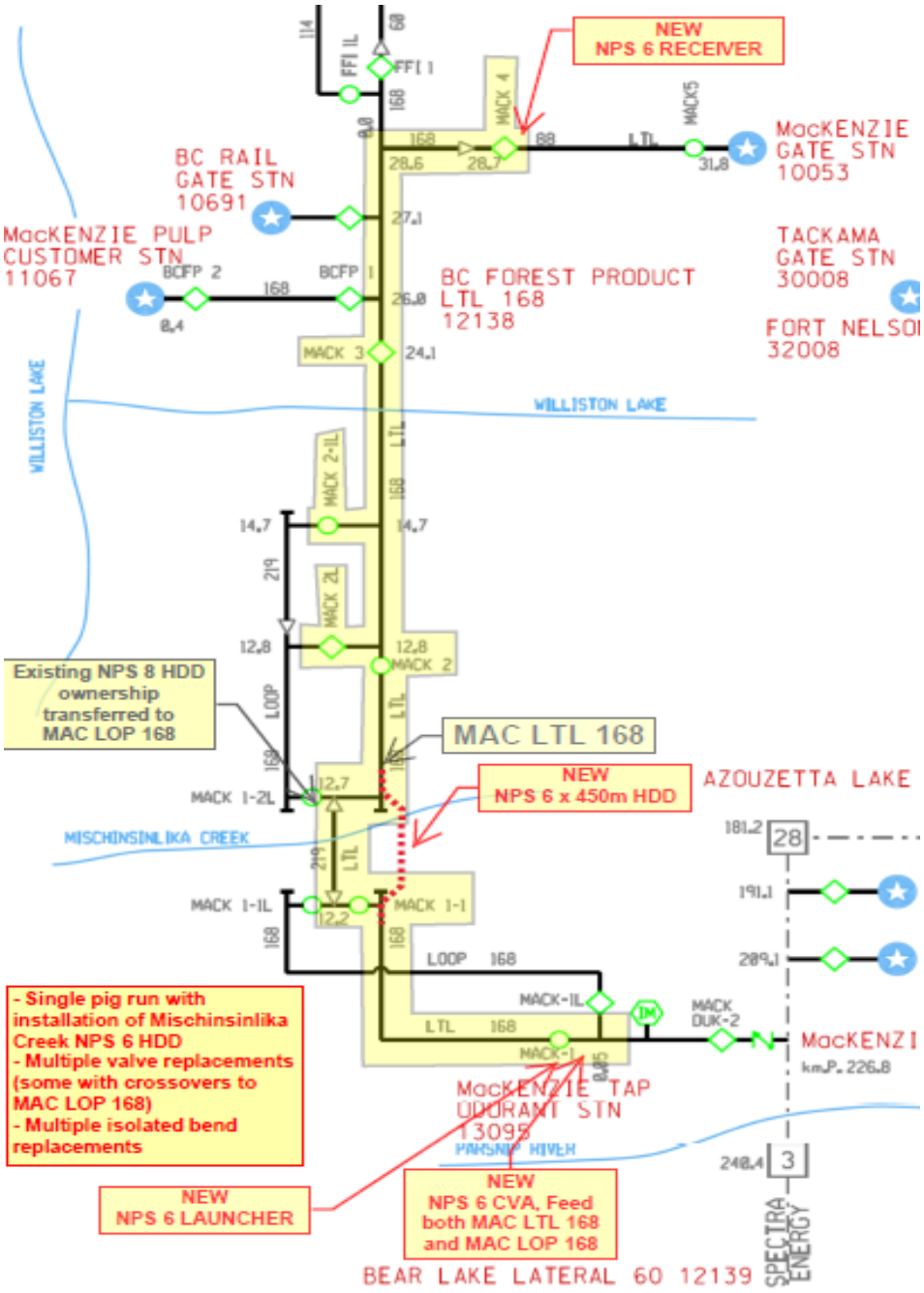
The current proposed design, pending further geotechnical review, is to install a new NPS 6 horizontal directional drill (HDD) of Mischinsinlika Creek to be tied into the MAC LTL 168. MAC LOP 168/219 will then solely utilize the existing NPS 8 HDD crossing.

All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

Table K-2: MAC LTL 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	1	Typical design, serve both LTL & LOP
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	4	Typical design
Elbow/Bend Replacements	NPS 6	32	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	7	
Receivers Assemblies (RA)	NPS 6	1	
Horizontal Directional Drilled Crossings (HDD)	NPS 6	1 at ~450 m	Mischinsinlika Creek
Stopple Upgrades (SU)	NPS 6	11	
Pipe Segments	NPS 6	0	None

Figure K-1: Mackenzie Lateral 168 Flow Schematic



1.1.1.3 *Land Requirements*

At the existing Mackenzie Tap Odorant Station, there will be one CVA and two launcher assemblies (LA), with one LA serving the MAC LOP 168/219. The land requirement estimate is approximately 34 metres wide by 28 metres long, where 23 metres wide by 15 metres long of existing land, to accommodate the three assemblies.

The receiver assembly (RA) will be installed at KP 28+678 where the pipeline changes its diameter from NPS 6 to NPS 3. The land requirement estimate is based on the typical land layout without considering the utilization of existing sites.

1.1.1.4 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.1.5 *Deviation from Typical ILI Upgrade*

The CVA is required to be installed upstream of both MAC LTL 168 and MAC LOP 168/219 to provide pressure control over the system.

The proposed design is to install a new NPS 6 HDD crossing of Mischinsinlika Creek for the MAC LTL 168, which will enable a single continuous ILI run for the entire length of the lateral. The existing NPS 8 HDD will become part of the MAC LOP 168/219.

1.1.1.6 *Noteworthy Pipe Additions*

The proposed 450 metres NP6 HDD crossing of the Mischinsinlika Creek. A geotechnical field investigation of the area was completed in June, 2005 and will be used as a reference in the detailed design for this crossing. The existing NPS 8 crossing was installed using the HDD method, so the confidence level in successfully executing the HDD is high.

As a result of the additional crossing, there will be consideration to remove the crossover valves at KP 12+700 and 12+800, but this will be determined during detailed design.

The MAC LTL 168 has a high bend replacement count relative to its length.

1.1.1.7 *Pipe Diameter Changes*

Existing pipe diameter changes from NPS 6 to NPS 3 at KP 28+678 and will not impact the Project.

1.1.1.8 *System Configuration Notes*

A single CVA will service both MAC LTL 168 and MAC LOP 168/219.

1.1.1.9 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate the existing odorant station piping configuration, one CVA serving two laterals, and two LAs at the one shared site.

1.1.2 Lateral 2 – Mackenzie Loop 168/219 (MAC LOP 168)

The MAC LOP 168/219, identified as Lateral 2 for this Project, has ILI selected as the preferred alternative.

1.1.2.1 *Existing System*

The NPS 6 & 8 diameter, 14,248 metre long MAC LOP 168 branches off the Enbridge (formerly Spectra) system, near the town of Mackenzie, BC. At this take-off location, there is an existing facility called the Mackenzie Tap Odorant Station. The MAC LOP 168 shares ROW with the MAC LTL 168 from KP 0+000 to KP 12+263 as well as from KP 12+710 to KP 14+743. At the crossing of the Mischinsinlika Creek, both the MAC LTL 168 and the MAC LOP 168 share a common NPS 8 HDD crossing.

Table K-3: Existing MAC LOP168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+048	12+710	NPS 6	1972
12+710	12+856	NPS 6	1972
12+856	14+743	NPS 8	2004

1.1.2.2 *Proposed ILI Modification Tally*

The MAC LOP 168 upgrade requirements are indicated in Table K-4. The CVA installed on MAC LTL 168 will service both lateral and loop. Thus, MAC LOP 168 does not require an additional CVA.

The current proposed design, pending further geotechnical review, is to install a new NPS 6 horizontal directional drill (HDD) of Mischinsinlika Creek. The existing NPS 8 HDD crossing will then be solely utilized by MAC LOP 168/219. There will be about 150 metres of NPS 8 new pipe installation to replace the existing NPS 6 diameter pipe from KP 12+710 to KP 12+856 to enable NPS 8 ILI run from the start of the creek crossing at KP 12+264 to the end of the loop at KP 14+743.

All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

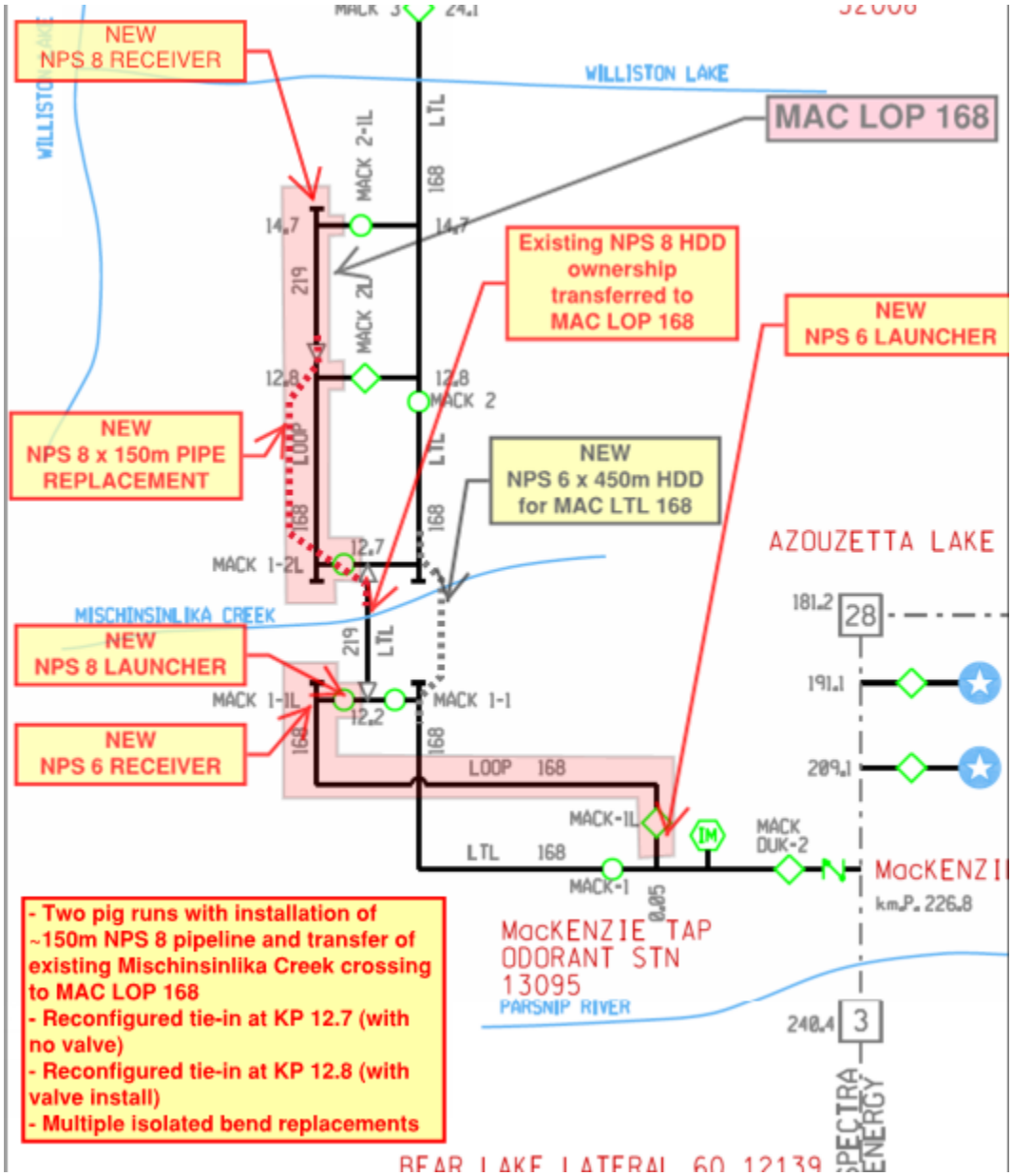
Table K-4: MAC LOP 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	0	Typical design, serve both LTL & LOP
Launchers Assemblies (LA)	NPS 6	1	Typical design
Launchers Assemblies (LA)	NPS 8	1	Typical design

Appurtenance Type	Mainline Size	# of Instances	Notes
Main Line Valve Assemblies (MLVA)	NPS 6	4	Typical design
Elbow/Bend Replacements	NPS 6	10	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	4	
Receivers Assemblies (RA)	NPS 6	1	Typical design
Receivers Assemblies (RA)	NPS 8	1	Typical design
Stopple Upgrades (SU)	NPS 6	0	
Pipe Segments	NPS 6	1(~150 m)	Downstream of Mischinsinlika Creek, NPS 6 to be replaced by NPS 8

1.1.2.3 *System Flow Schematic*

Figure K-2: Mackenzie Loop 168 Flow Schematic



1.1.2.4 *Land Requirements*

At the existing Mackenzie Tap Odorant Station there will be one CVA and two launcher assemblies (LA), with one LA serving the MAC LOP 168/219. The land requirement estimate is based on typical land requirements, although in this case with an existing station site, it will be expanded to approximately 34 metres wide by 28 metres long, where 23 metres wide by 15 metres long of existing land, to accommodate the three assemblies, and therefore reduce the overall estimated requirement.

The receiver assemblies (RA) will be installed at KP 12+264 and KP 14+743 as MAC LOP 168 changes its diameter from NPS 6 to NPS 8. The land requirement estimate is based on the typical land layout without considering the utilization of existing sites.

1.1.2.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.2.6 *Deviation from Typical ILI Upgrade*

The CVA will be installed upstream of both MAC LTL 168 and MAC LOP 168/219 to provide pressure control over the system. Thus, MAC LOP 168/219 does not require an additional CVA.

There are two sets of launchers and receivers due to pipe diameter change of MAC LOP 168/219. The NPS 6 diameter pipe segment from KP 12+710 to KP 12+856 will be replaced with NPS 8 diameter to enable 8" ILI run through NPS 8 HDD to the end of the loop line at KP 14+743. The existing NPS 8 pipeline HDD crossing will belong to MAC LOP 168/219.

1.1.2.7 *Noteworthy Pipe Additions*

There is about 150 metres of pipe additions for MAC LOP 168/219 from KP 12+710 to KP 12+856.

1.1.2.8 *Pipe Diameter Changes*

Existing pipe diameter changes from NPS 6 to NPS 8. Two sets of LA and RA and about 150 metres of new pipe segment are required for the modification scope due to the diameter change.

1.1.2.9 *System Configuration Notes*

A single CVA will service both MAC LTL 168 and MAC LOP 168/219.

1.1.2.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA and RA and CVA to accommodate: the existing odorant station piping configuration, one CVA serving two laterals, and 2 LAs at the one shared site.

1.1.3 Lateral 7 – Prince George 1 Lateral 168 (PG1 LTL 168)

The PG1 LTL 168, identified as Lateral 7 for this Project, has ILI selected as the preferred alternative.

1.1.3.1 *Existing System*

The NPS 6 diameter, 4,713 metre long PG1 Lateral branches off the Enbridge (formerly Spectra) system, near the city of Prince George, BC. At this take-off location, there is an existing facility called PG Station. PG1 LTL 168 connects in series to the Prince George Pulp Lateral 168 (PGP LTL 168) which connects in turn to the Husky Lateral 168 (HUS LTL 168). These three laterals form a critical transmission system for Prince George region as it supplies several large industrial customers. The requirements of the large industrial customers need to be considered in planning all work on the lateral.

Table K-5: Existing PG1 LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0-121	4+713	NPS 6	1957

1.1.3.2 *Proposed ILI Modification Tally*

The PG1 LTL 168 upgrade requirements are indicated in Table K-6. The CVA installed on PG1 LTL 168 will be primarily used for PG1 work but will affect the downstream PGP LTL 168 and HUS LTL 168, which will need to be taken into consideration at the time.

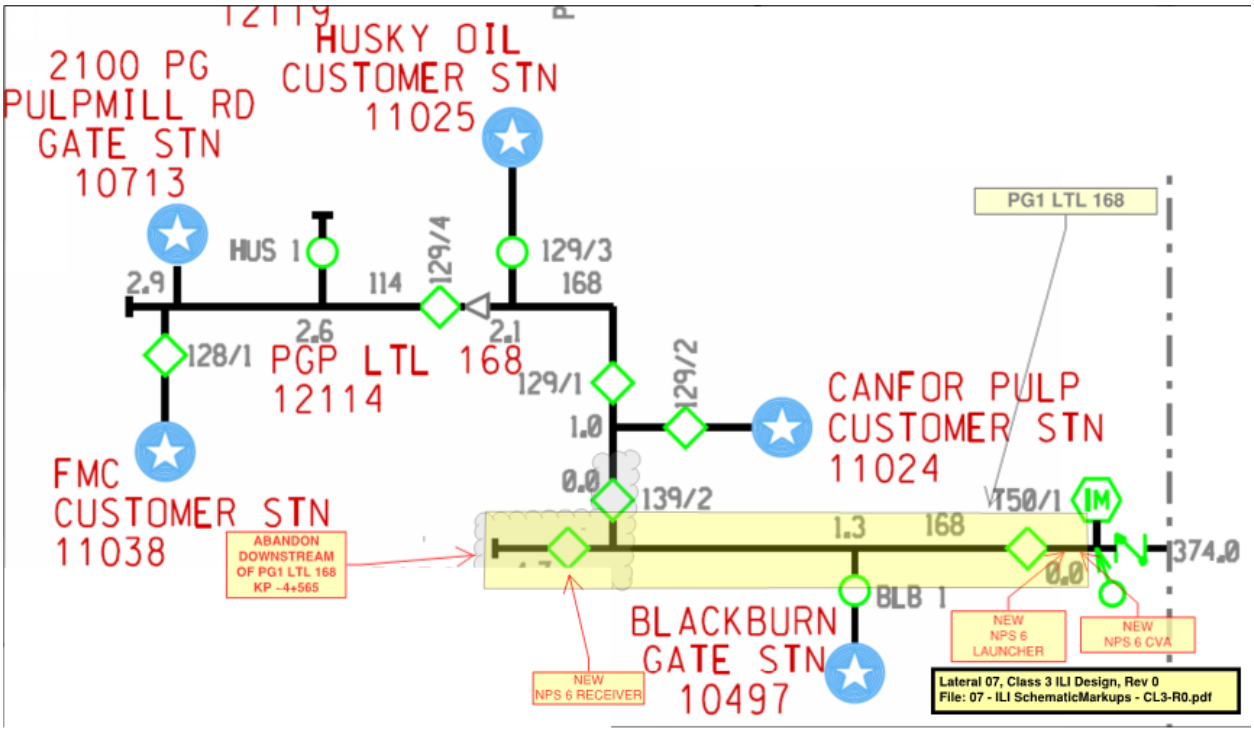
All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

Table K-6: PG1 LTL 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	1	Typical design, serve both LTL & LOP
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	1	Typical design
Elbow/Bend Replacements	NPS 6	6	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	0	
Receivers Assemblies (RA)	NPS 6	1	
Stopple Upgrades (SU)	NPS 6	4	
Pipe Segments	NPS 6	1(~12 m)	Removal of existing valve PG1 T50/1

1.1.3.3 *System Flow Schematic*

Figure K-3: PG1 LTL 168 Flow Schematic



1.1.3.4 *Land Requirements*

At the existing PG Station, one CVA and one launcher assemblies (LA) will be added. The site will be expanded to accommodate the new addition of two assemblies.

The receiver assemblies (RA) will be installed at the end of PG1 LTL.

1.1.3.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.3.6 *Deviation from Typical ILI Upgrade*

The existing valve PG1 T50/1 will be abandoned in place. As the location is next to the railway corridor and difficult to seek construction permit, the new Mainline Valve Assembly (MLVA) will be installed upstream of the existing valve to provide better construction access. The estimated new pipe segment required due to the removal of existing valve is about 12 metres in length.

1.1.3.7 *Noteworthy Pipe Additions*

There are about 12 metres of pipe additions for the PG1 LTL 168.

1.1.3.8 *Pipe Diameter Changes*

There are no pipe diameter changes for the PG1 LTL 168.

1.1.3.9 *System Configuration Notes*

The ILI run will be performed on just the Prince George 1 Lateral since the Prince George Pulp Lateral and the Husky Lateral have a different preferred alternative.

1.1.3.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate: the existing odorant station piping configuration, and two assembly additions at the one shared site.

1.1.4 Lateral 14 - Salmon Arm Loop 168 (SAL LOP 168)

The SAL LOP 168, identified as Lateral 14 for this Project, has ILI selected as the preferred alternative.

1.1.4.1 *Existing System*

The NPS 6 diameter, 44,938 metre long SAL LOP 168 branches off the NPS 12 diameter Savona Penticton Pipeline. At this take-off location, there is an existing facility called the SN-6 Valve Station. The SAL LOP shares right-of-way with the Salmon Arm Lateral 114. These two pipelines have several interconnects and serve multiple customers. SAL LOP 168 can be isolated by utilizing isolation valves and flowing through the Salmon Arm Lateral 114. There may be a reduction in bypass requirements or utilization of the Salmon Arm Lateral 114 may be sufficient as a bypass given that construction is coordinated in the right schedule window by working with operation and system capacity planning.

Table K-7: Existing SAL LOP 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+012	NPS 6 Valve Station	2012
0+012	7+836	NPS 6	1976
7+836	7+855	NPS Road Crossing	1993
7+855	25+710	NPS 6	1976 & 1981
25+710	25+765	NPS Road Crossing	2007
25+765	38+539	NPS 6	1981 & 1987
38+539	38+553	NPS 6 Valve Station	2013
38+553	44+939	NPS 6	1993

1.1.4.2 *Proposed ILI Modification Tally*

The SAL LOP 168 upgrade requirements are indicated in Table K-8. The CVA installed will service both it and the Salmon Arm Lateral 114.

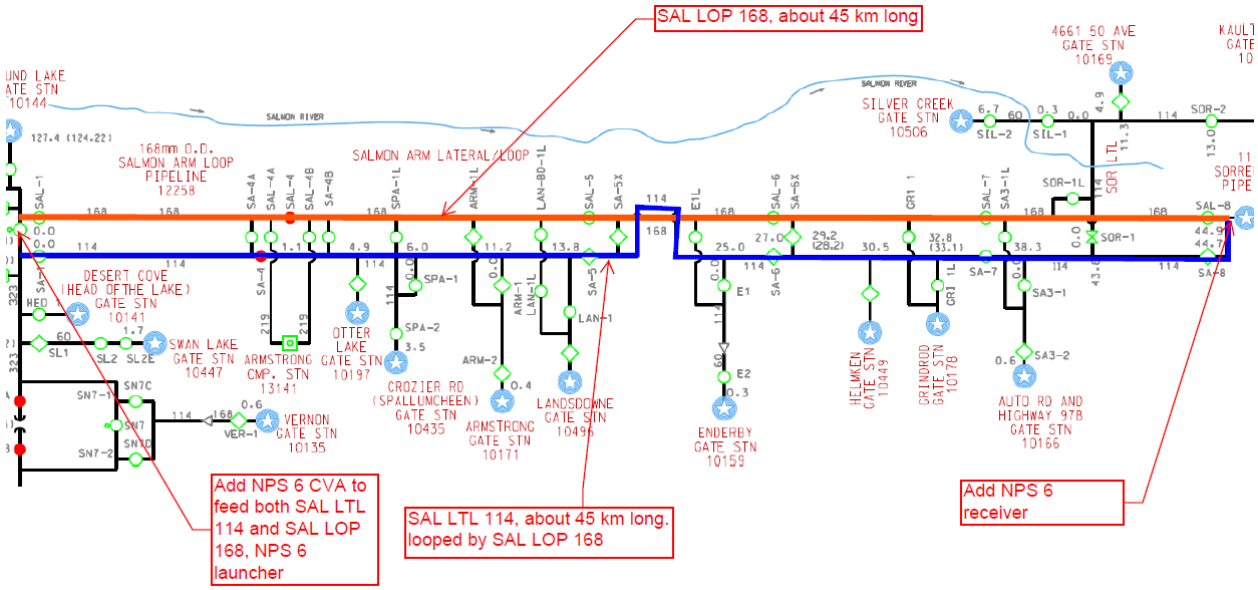
All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

Table K-8: SAL LOP 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	1	Typical design
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	4	Typical design
Elbow/Bend Replacements	NPS 6	17	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	13	
Receivers Assemblies (RA)	NPS 6	1	Typical design
Stopple Upgrades (SU)	NPS 6	4	
Pipe Segments	NPS 6	0	None

1.1.4.3 *System Flow Schematic*

Figure K-4: SAL LOP 168 System Flow Schematic



1.1.4.4 *Land Requirements*

The existing SN-6 Station will be extended 15 metres to accommodate the additions of one CVA and one launcher assembly (LA), with the CVA serving both Salmon Arm Lateral and Loop. The existing Salmon Arm Gate Station is sufficient to accommodate the RA.

1.1.4.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.4.6 *Deviation from Typical ILI Upgrade*

The CVA is required to be installed upstream of both Salmon Arm Lateral 114 and SAL LOP 168 to provide pressure control over the system.

1.1.4.7 *Noteworthy Pipe Additions*

There are no noteworthy pipe additions for SAL LOP 168.

1.1.4.8 *Pipe Diameter Changes*

Pipe diameter does not change for SAL LOP 168.

1.1.4.9 *System Configuration Notes*

A single CVA will service both Salmon Arm Lateral 114 and SAL LOP 168.

1.1.4.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate the existing station piping configuration, one CVA serving two lines, and two assemblies at the existing shared site.

1.1.5 Lateral 22 – Fording Lateral 219/168 (FRD LTL 219/168)

The Fording Lateral 219/168, identified as Lateral 22 for this Project, has ILI selected as the preferred alternative.

1.1.5.1 *Existing System*

The NPS 6 & 8 diameter, 79,659 metre long Fording Lateral branches off the TransCanada Pipeline Tap near Sparwood, BC. The existing FortisBC Valve SPR1 Station is about 80 metres from the TransCanada Meter Station. The Fording Lateral changes its diameter from NPS 8 to NPS 6 at KP 34+557. It is a critical line in the Transmission system as it supplies several coal mine plants.

Table K-9: Existing FRD LTL 219/168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+010	0+043	NPS 8 Valve Station	2005
0+043	34+557	NPS 8	1971*
34+557	79+670	NPS 6	1971*

* Some crossings have been modified in 1981, 1983, 1984, 1995, 2006, 2012 and 2014

1.1.5.2 *Proposed ILI Modification Tally*

A large number of appurtenances (valves, fittings) on FRD LTL 219/168 require upgrade in order for the lateral to be ILI capable. The FRD LTL 168 upgrade requirements are indicated in Table K-10. The CVA and NPS 8 LA will be installed at the beginning of the lateral.

There are two sets of Launcher/Receiver Assemblies (LRA) on Fording Lateral 219/168 due to the diameter change. The NPS 6 portion of Fording Lateral will require an individual CVA to provide pressure control over the downstream of NPS 6 section to reduce impact on large base of customers serviced by Fording Lateral, especially the industrial customers. The NPS 6 Receiver Assembly (RA) is planned to locate near the tailing pond. And the pipe segment downstream of the new added Receiver Assembly is planned to be turned over to the coal mine

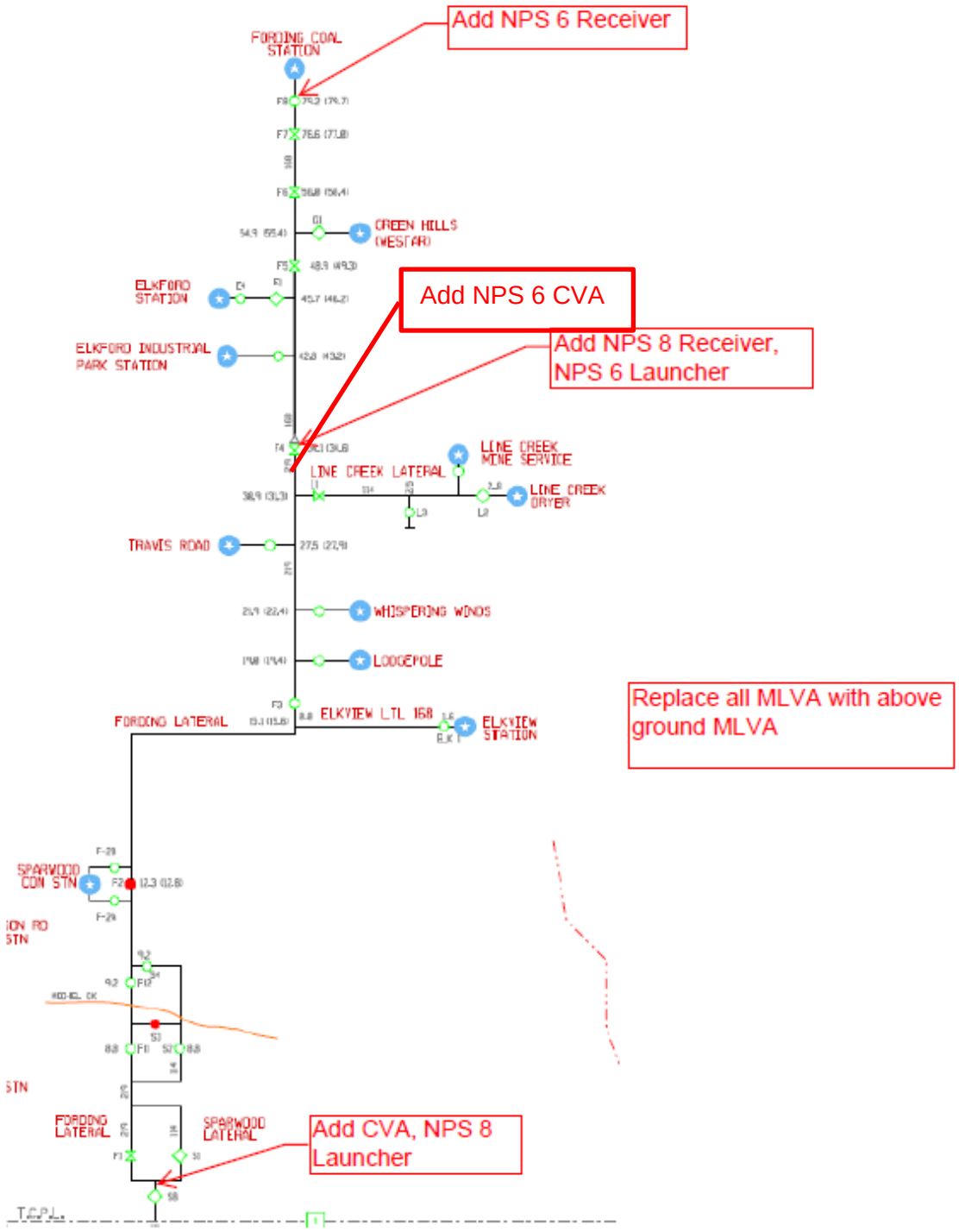
plant as plant piping. All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

Table K-10: FRD LTL 219/168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assembly (CVA)	NPS 8	1	Typical design
Control Valve Assembly (CVA)	NPS 6	1	Typical design
Launchers Assembly (LA)	NPS 8	1	Typical design
Launchers Assembly (LA)	NPS 6	1	Typical design
Mainline Valve Assembly (MLVA)	NPS 8	5	Typical design
Mainline Valve Assembly (MLVA)	NPS 6	5	Typical design
Elbow/Bend Replacements (BR)	NPS 8	60	Excludes new tie-in bends
Elbow/Bend Replacements (BR)	NPS 6	40	Excludes new tie-in bends
Tee/Branch Replacements (BR)	NPS 8	10	
Tee/Branch Replacements (BR)	NPS 6	1	
Receivers Assembly (RA)	NPS 8	1	Typical design
Receivers Assembly (RA)	NPS 6	1	Typical design
Stopple Upgrades (SU)	NPS 6	21	
Pipe Segments	NPS 6	1 (33m)	Fording mine road crossing counted as 80 m of HD bore
Pipe Segments	NPS 8	9(32m, 240m, 24m, 208m, 20m, 244m, 31m,38m,76m)	31 m pipe replacement, BR equivalent; 240 m pipe replacement; 24 m pipe replacement, BR equivalent; 208 m pipe replacement; 20 m road crossing, estimated as 60 m of HD bore; 244 m pipe replacement; 31 m road crossing, estimated as 60 m of HD bore; 38 m pipe replacement, BR equivalent; 76 m road crossing, estimated as 60 m of HD bore;

1.1.5.3 *System Flow Schematic*

Figure K-5: FRD LTL 219/168 Flow Schematic



Lateral 22, Class 3 ILI Design, Rev 0
File: 22 - ILI Schematic Markups - CL3-R0.pdf

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1.1.5.4 *Land Requirements*

The existing FortisBC Valve SPR1 Station (10.8 metres X 20 metres) is at 80 metre distance from the TransCanada Meter Station. The site will be extended 15 metres toward TransCanada Meter Station to accommodate the CVA and NPS 8 LA.

The NPS 6 CVA, NPS 8 RA and NPS 6 LA will be installed at FortisBC Valve FRD 4 Site where the Fording Lateral changes its diameter from NPS 8 to NPS 6. The existing FortisBC Valve FRD 4 site will be expanded to accommodate the CVA and two new sets of LRA.

The NPS 6 RA will be installed near the tailing pond, not at the end of Fording Lateral. The purpose is to convert the pipe segment downstream from that point to plant piping and to be turned over to coal mine operation.

1.1.5.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.5.6 *Deviation from Typical ILI Upgrade*

There are two sets of LA and RA due to diameter change of the Fording Lateral 219/168.

1.1.5.7 *Noteworthy Pipe Additions*

There are no noteworthy pipe additions observed.

1.1.5.8 *Pipe Diameter Changes*

The pipe diameter of the Fording Lateral changes from NPS 8 to NPS 6.

1.1.5.9 *System Configuration Notes*

Some valve/fitting modifications have been completed recently at FortisBC Valve FRD 4 site where the Fording Lateral changes its diameter from NPS 8 to NPS 6.

1.1.5.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate: the existing station piping configuration, two sets of LRA and the proposed new location for RA in the coal mine plant.

1.1.6 Lateral 24 – Cranbrook Lateral 168 (CRK LTL 168)

The Cranbrook Lateral 168, identified as Lateral 24 for this Project, has ILI selected as the preferred alternative.

1.1.6.1 *Existing System*

The NPS 6 diameter, 34,028 metre long Cranbrook Lateral branches off the TransCanada Pipeline meter station. There is an existing FortisBC Valve Station called Gold Creek Station, where Valve CRA 2, Valve CRA 1 & CRA 27 are located. It shares ROW with Cranbrook Loop 219 (CRK LOP 219) along its entire length and has three (3) crossover valves interconnecting the two laterals.

Table K-11: Existing CRK LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	34+028	NPS 6	1962

1.1.6.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on CRK LTL 168 require upgrade in order for the lateral to be ILI capable. The CRK LTL 168 upgrade requirements are indicated in Table K-12. The CVA and NPS 6 LA will be installed at the beginning of the lateral. This single NPS 6 CVA will apply pressure control over the entire Cranbrook transmission system, which includes Cranbrook Lateral 168, Cranbrook Loop 219, Cranbrook Kimberley Loop 273, Cranbrook Kimberley Loop 219, Kimberley Lateral 168 and Skookumchuck Lateral 219.

The NPS 6 RA is planned to be located at the existing FortisBC Cranbrook Station where the Cranbrook Lateral 168 ends.

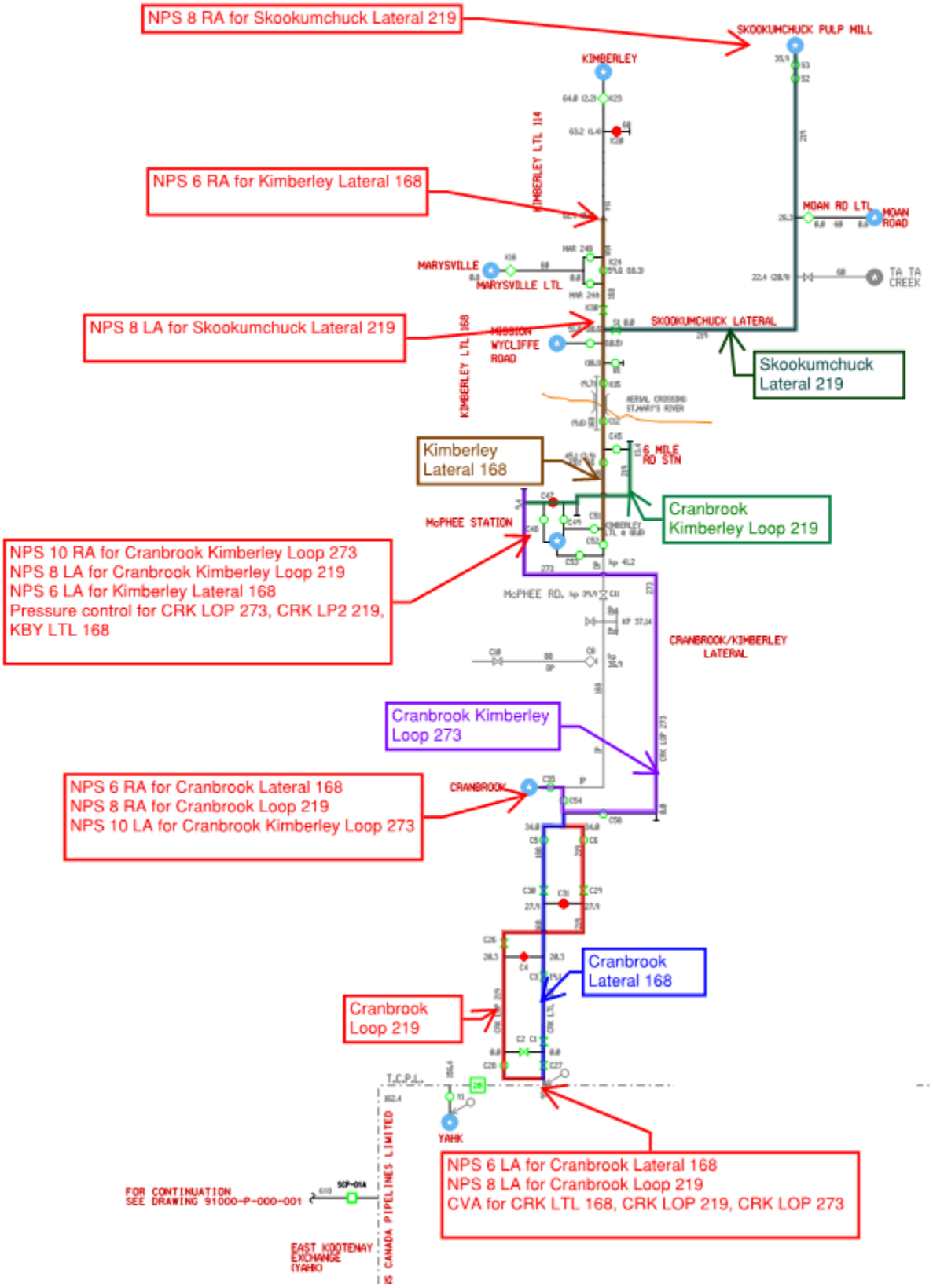
All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping. As the Cranbrook Lateral 168 is looped by the Cranbrook Loop 219 with its entire length, there will be the opportunities of utilizing Cranbrook Loop 219 as a bypass to minimize stopple-bypass requirements.

Table K-12: CRK LTL 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	1	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	2	Typical design
Elbow/Bend Replacements	NPS 6	7	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	3	
Receivers Assemblies (RA)	NPS 6	1	Typical design
Stopple Upgrades (SU)	NPS 6	0	
Pipe Segments	NPS 6	0	None

1.1.6.3 *System Flow Schematic*

Figure K-6: Cranbrook-Kimberley System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
NPS 6 RA for Kimberley Lateral 168
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
NPS 8 LA for Skookumchuck Lateral 219
KIMBERLEY LTL 168
MISSION WYCLIFFE ROAD
SKOOKUMCHUCK LATERAL
Skookumchuck Lateral 219
AERIAL CROSSING ST.MARY'S RIVER
Kimberley Lateral 168
6 MILE RD STN
Cranbrook Kimberley Loop 219
McPHEE STATION
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
Cranbrook Kimberley Loop 273
CRANBROOK
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
T.C.P.L.
YAHK
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
FOR CONTINUATION SEE DRAWING 91000-P-000-001
EAST KOOTENAY EXCHANGE (YAHK)
CANADA PIPELINES LIMITED

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1.1.6.4 *Land Requirements*

The existing FortisBC Gold Creek Station where Valve CRA 2, Valve CRA 1 & CRA 27 are located will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 CVA, NPS 6 LA and NPS 8 LA. The single NPS 6 CVA will provide pressure control to the entire Cranbrook system. The NPS 6 LA is for ILI runs of Cranbrook Lateral 168 while the NPS 8 LA is for Cranbrook Loop 219. The current Gold Creek Station is 12 metres by 23.5 metres.

The existing Cranbrook Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 RA, NPS 8 RA and NPS 10 LA. The NPS 6 RA is for Cranbrook Lateral 168 while NPS 8 RA and NPS 10 LA are for Cranbrook Loop 219 and Cranbrook Kimberley 273, respectively.

1.1.6.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.6.6 *Deviation from Typical ILI Upgrade*

There are three (3) deviations from typical ILI upgrades as follows:

- The existing FortisBC Gold Creek Station will be expanded to be a shared site for Cranbrook Lateral 168 and Cranbrook Loop 219 to accommodate one CVA, one NPS 6 LA and one NPS 8 LA
- The existing FortisBC Cranbrook Station will be expanded to be a shared site for Cranbrook Lateral 168, Cranbrook Loop 219 and Cranbrook Kimberley 273 to accommodate one NPS 6 RA, one NPS 8 RA and one NPS 10 LA
- Cranbrook Lateral 168 and Cranbrook Loop 219 share ROW over the entire length

1.1.6.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.6.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.6.9 *System Configuration Notes*

One single CVA will provide pressure control over the entire Cranbrook system. Stopple-bypass requirements may be reduced or eliminated for Cranbrook Lateral 168 during weather that allows Cranbrook Loop 219 to be utilized as a bypass sufficient for downstream support.

1.1.6.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate: the existing valve station piping configuration and the proposed shared sites configuration.

1.1.7 Lateral 25 – Cranbrook Loop 219 (CRK LOP 219)

The Cranbrook Loop 219, identified as Lateral 25 for this Project, has ILI selected as the preferred alternative.

1.1.7.1 *Existing System*

The NPS 8 diameter, 34,030 metre long Cranbrook Loop branches off the TransCanada Pipeline meter station. There is an existing FortisBC Valve Station called Gold Creek Station, where Valve CRA 2, Valve CRA 1 & CRA 27 are located. It shares ROW with Cranbrook Lateral 168 (CRK LTL 168) with its entire length and have three valves interconnecting them.

Table K-13: Existing CRK LOP 219 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	20+273	NPS 8	1968
20+273	34+030	NPS 8	1985

1.1.7.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on CRK LOP 219 require upgrade in order for the lateral to be ILI capable. The CRK LOP 219 upgrade requirements are indicated in Table K-14. The CVA is not required for this line as it shares the single CVA installed for the Cranbrook system. The NPS 8 LA will be installed at the existing FortisBC Gold Creek Station.

The NPS 8 RA is planned to be located at the existing FortisBC Cranbrook Station where the Cranbrook Loop 219 ends.

All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping. As the Cranbrook Loop 219 is looped by the Cranbrook Lateral 168 along its entire length, there will be opportunities of utilizing Cranbrook Lateral 168 as a bypass to reduce stopple-bypass requirements.

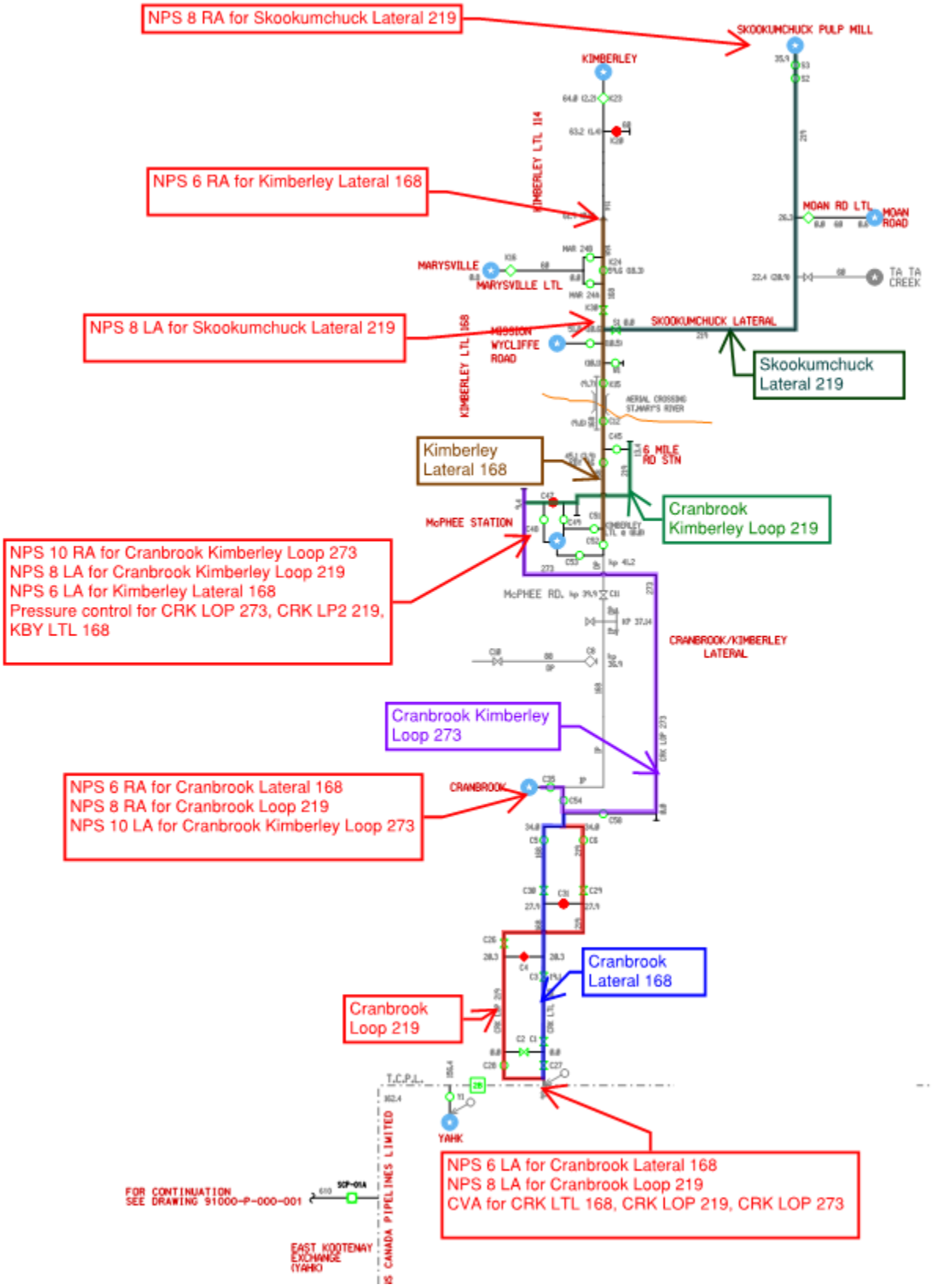
Table K-14: CRK LOP 219 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 8	0	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 8	1	Typical design
Main Line Valve Assemblies	NPS 8	2	Typical design

Appurtenance Type	Mainline Size	# of Instances	Notes
(MLVA)			
Elbow/Bend Replacements	NPS 8	7	Excludes new tie-in bends
Tee/Branch Replacements	NPS 8	3	
Receivers Assemblies (RA)	NPS 8	1	Typical design
Stopple Upgrades (SU)	NPS 8	0	
Pipe Segments	NPS 8	0	None

1.1.7.3 *System Flow Schematic*

Figure K-7: CRK LOP 219 System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
NPS 6 RA for Kimberley Lateral 168
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
NPS 8 LA for Skookumchuck Lateral 219
KIMBERLEY LTL 168
MISSION WYCLIFFE ROAD
SKOOKUMCHUCK LATERAL
Skookumchuck Lateral 219
AERIAL CROSSING ST.MARY'S RIVER
Kimberley Lateral 168
6 MILE RD STN
Cranbrook Kimberley Loop 219
McPHEE STATION
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
Cranbrook Kimberley Loop 273
CRANBROOK
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
T.C.P.L.
YAHK
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
FOR CONTINUATION SEE DRAWING 91000-P-000-001
EAST KOOTENAY EXCHANGE (YAHK)
CANADA PIPELINES LIMITED

1.1.7.4 *Land Requirements*

The existing FortisBC Gold Creek Station, where Valve CRA 2, Valve CRA 1 & CRA 27 are located, will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 CVA, NPS 6 LA and NPS 8 LA. The single NPS 6 CVA will provide pressure control to the entire Cranbrook system. The NPS 6 LA is for ILI runs of Cranbrook Lateral 168 while the NPS 8 LA is for Cranbrook Loop 219. The current Gold Creek Station is 12 metres by 23.5 metres.

The existing Cranbrook Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 RA, NPS 8 RA and NPS 10 LA. The NPS 6 RA is for Cranbrook Lateral 168 while NPS 8 RA and NPS 10 LA are for Cranbrook Loop 219 and Cranbrook Kimberley 273, respectively.

1.1.7.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.7.6 *Deviation from Typical ILI Upgrade*

There are three (3) deviations from typical ILI upgrades as following:

- The existing FortisBC Gold Creek Station will be expanded to be a shared site for Cranbrook Lateral 168 and Cranbrook Loop 219 to accommodate one CVA, one NPS 6 LA and one NPS 8 LA
- The existing FortisBC Cranbrook Station will be expanded to be a shared site for Cranbrook Lateral 168, Cranbrook Loop 219 and Cranbrook Kimberley 273 to accommodate one NPS 6 RA, one NPS 8 RA and one NPS 10 LA
- Cranbrook Lateral 168 and Cranbrook Loop 219 share ROW over the entire length

1.1.7.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.7.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.7.9 *System Configuration Notes*

One single CVA will provide pressure control over the entire Cranbrook system. Stopple-bypass requirement may be reduced for Cranbrook Loop 219 during times Cranbrook Lateral 168 can be utilized as a bypass.

1.1.7.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA, RA and CVA to accommodate: the existing valve station piping configuration and the proposed shared sites configuration.

1.1.8 Lateral 27 – Cranbrook Kimberly Loop 273 (CRK LOP 273)

The Cranbrook Kimberley Loop 273, identified as Lateral 27 for this Project, has ILI selected as the preferred alternative.

1.1.8.1 *Existing System*

The NPS 10 diameter, 9,409 metre long Cranbrook Kimberley Loop branches off at Cranbrook Station and ends at McPhee Station. It connects Cranbrook Lateral 168, Cranbrook Loop 219 and Kimberley Lateral 168.

Table K-15: Existing CRK LOP 273 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	9+409	NPS 10	1992

1.1.8.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on CRK LOP 273 require upgrade in order for the lateral to be ILI capable. The CRK LOP 273 upgrade requirements are indicated in Table K-16. The CVA is not required for this line as it shares the single CVA of Cranbrook system. The NPS 10 LA will be installed at the existing FortisBC Cranbrook Station. The NPS 10 RA is planned to be located at the existing FortisBC McPhee Station where the Cranbrook Kimberley Loop 273 ends.

All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

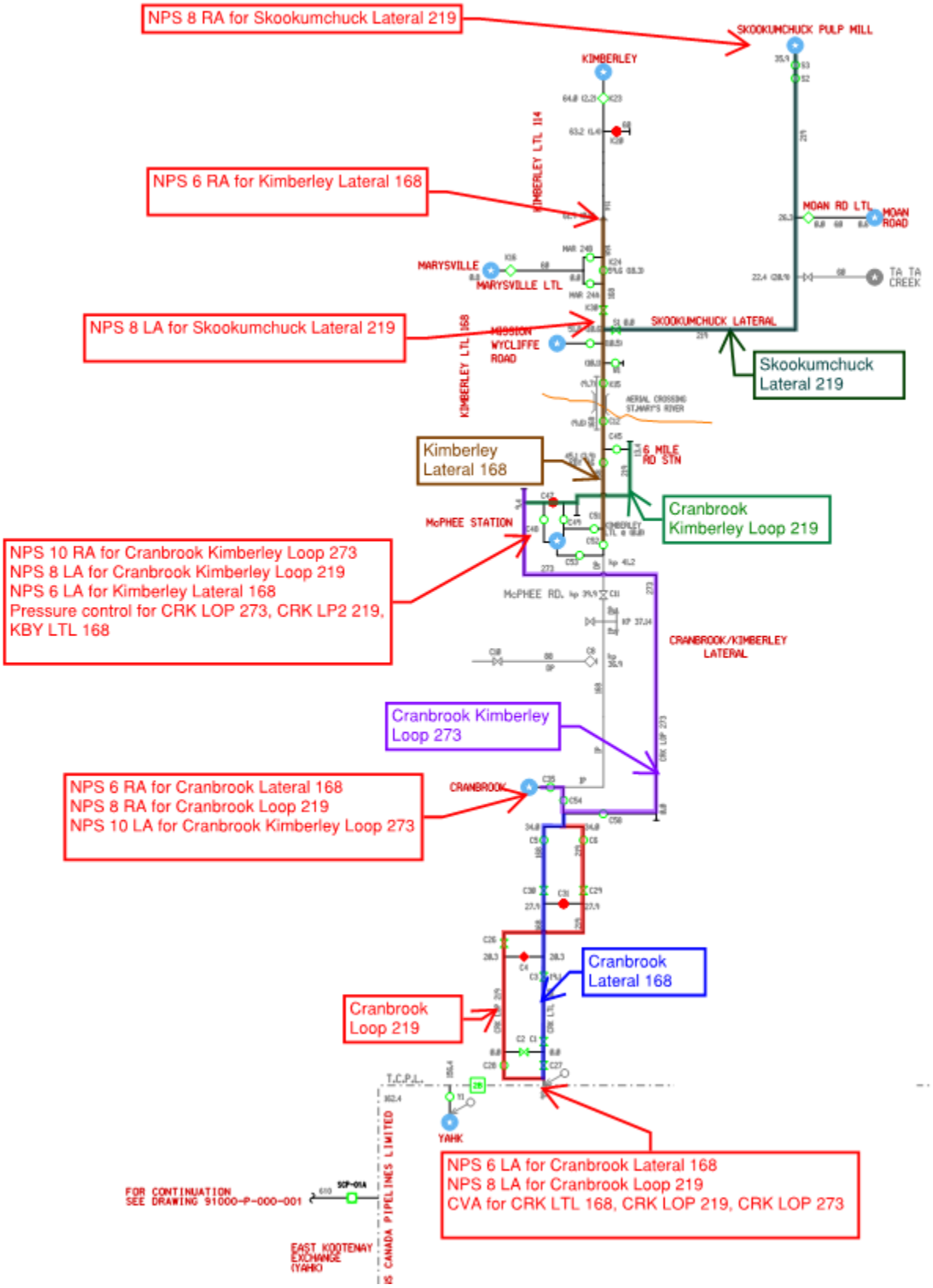
Table K-16: CRK LOP 273 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 10	0	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 10	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 10	0	
Elbow/Bend Replacements	NPS 10	3	Excludes new tie-in bends
Tee/Branch Replacements	NPS 10	0	

Appurtenance Type	Mainline Size	# of Instances	Notes
Receivers Assemblies (RA)	NPS 10	1	Typical design
Stopple Upgrades (SU)	NPS 10	0	
Pipe Segments	NPS 10	0	None

1.1.8.3 *System Flow Schematic*

Figure K-8: CRK LOP 273 System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
NPS 6 RA for Kimberley Lateral 168
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
NPS 8 LA for Skookumchuck Lateral 219
KIMBERLEY LTL 168
MISSION WYCLIFFE ROAD
SKOOKUMCHUCK LATERAL
Skookumchuck Lateral 219
AERIAL CROSSING ST.MARY'S RIVER
Kimberley Lateral 168
6 MILE RD STN
Cranbrook Kimberley Loop 219
McPHEE STATION
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
Cranbrook Kimberley Loop 273
CRANBROOK
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
T.C.P.L.
YAHK
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
FOR CONTINUATION SEE DRAWING 91000-P-000-001
EAST KOOTENAY EXCHANGE (YAHK)
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1.1.8.4 *Land Requirements*

The existing Cranbrook Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 RA, NPS 8 RA and NPS 10 LA. The NPS 6 RA is for Cranbrook Lateral 168 while NPS 8 RA and NPS 10 LA are for Cranbrook Loop 219 and Cranbrook Kimberley Loop 273, respectively.

The existing McPhee Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 LA, NPS 8 LA and NPS 10 RA. The NPS 6 LA is for Kimberley Lateral 168 while the NPS 8 LA is for Cranbrook

1.1.8.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.8.6 *Deviation from Typical ILI Upgrade*

There are two deviations from typical ILI upgrades as following:

- The existing FortisBC Cranbrook Station will be expanded to be a shared site to accommodate the NPS 6 RA for Cranbrook Lateral 168, NPS 8 RA for Cranbrook Loop 219 and the NPS 10 LA for Cranbrook Kimberley 273.
- The existing FortisBC McPhee Station will be expanded to be a shared site to accommodate the NPS 6 LA for Kimberley 168, the NPS 8 LA for Cranbrook Kimberley Loop 219 and the NPS 10 RA for Cranbrook Kimberley 273.

1.1.8.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.8.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.8.9 *System Configuration Notes*

One single CVA will provide pressure control over the entire Cranbrook system.

1.1.8.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA and RA to accommodate: the existing valve station piping configuration and the proposed shared sites configuration.

1.1.9 Lateral 26 – Cranbrook Kimberly Loop 219 (CRK LP2 219)

The Cranbrook Kimberley Loop 219, identified as Lateral 26 for this Project, has ILI selected as the preferred alternative.

1.1.9.1 *Existing System*

The NPS 8 diameter, 4,007 metre long Cranbrook Kimberley Loop branches off at McPhee Station and ends at 6 Mile Road Station. It shares the ROW with Kimberley Lateral 168.

Table K-17: Existing CRK LP2 219 Segments

From KP	To KP	Diameter	Predominant Year of Construction
9+417	13+424	NPS 8	1992

1.1.9.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on CRK LP2 219 require upgrade in order for the lateral to be ILI capable. The CRK LP2 219 upgrade requirements are indicated in Table K-18. The CVA is not required for this line since the pressure control can be applied at McPhee Control Station. The NPS 8 LA will be installed at the existing FortisBC McPhee Station. The NPS 8 RA is planned to be located at the existing FortisBC 6 Mile Road Station where the Cranbrook Kimberley Loop 219 ends.

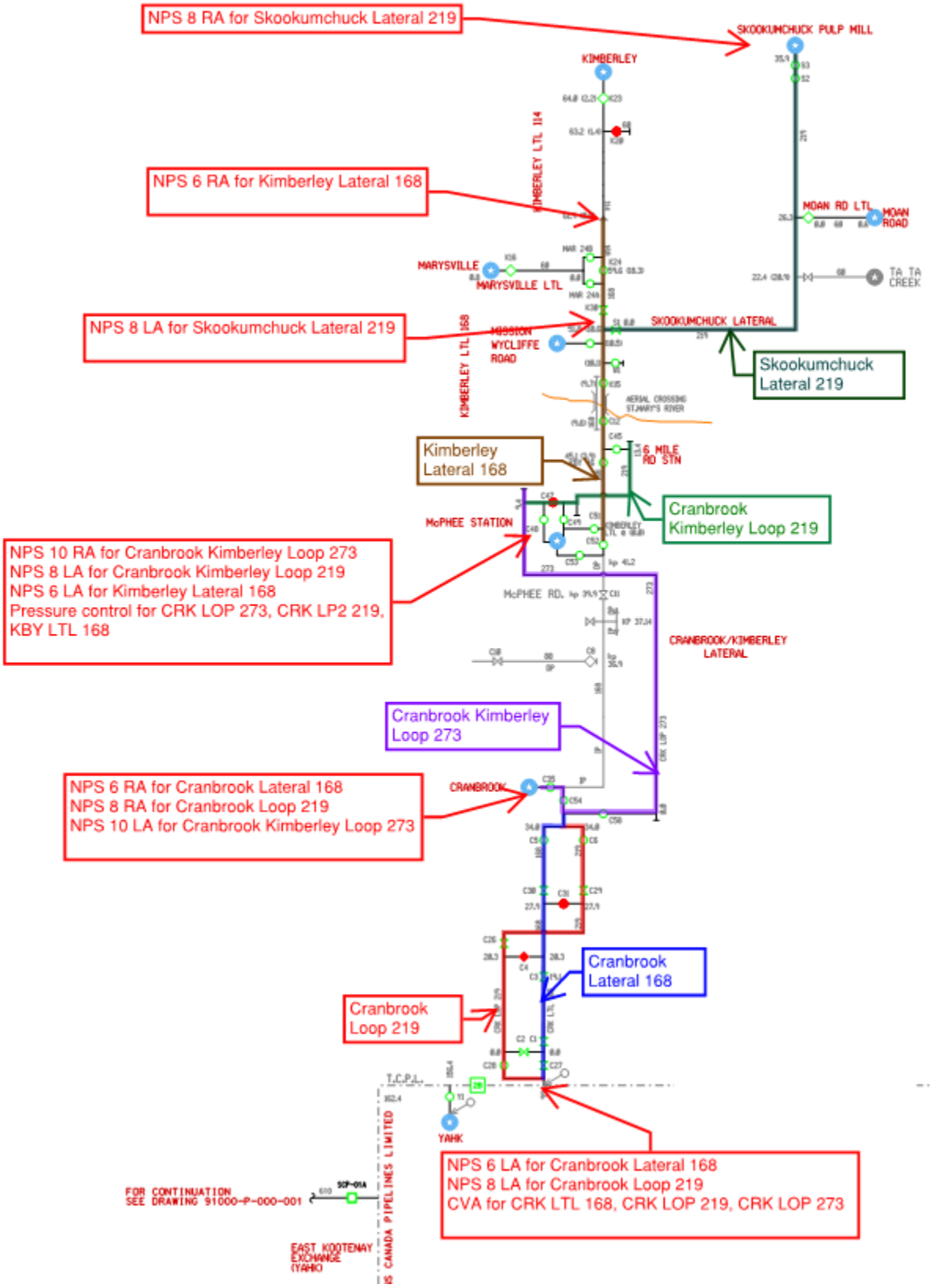
All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping. As the Cranbrook Kimberley Loop 219 is looped by the Kimberley Lateral 168 with its entire length, there may be an opportunity of utilizing Kimberley Lateral 168 as a bypass to reduce stopple-bypass requirement.

Table K-18: CRK LP2 219 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 8	0	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 8	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 8	0	
Elbow/Bend Replacements	NPS 8	2	Excludes new tie-in bends
Tee/Branch Replacements	NPS 8	0	
Receivers Assemblies (RA)	NPS 8	1	Typical design
Stopple Upgrades (SU)	NPS 8	0	
Pipe Segments	NPS 8	0	None

1.1.9.3 *System Flow Schematic*

Figure K-9: CRK LP2 219 System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
NPS 6 RA for Kimberley Lateral 168
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
NPS 8 LA for Skookumchuck Lateral 219
KIMBERLEY LTL 168
MISSION WYCLIFFE ROAD
SKOOKUMCHUCK LATERAL
Skookumchuck Lateral 219
AERIAL CROSSING ST.MARY'S RIVER
Kimberley Lateral 168
6 MILE RD STN
Cranbrook Kimberley Loop 219
McPHEE STATION
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
Cranbrook Kimberley Loop 273
CRANBROOK
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
T.C.P.L.
YAHK
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
FOR CONTINUATION SEE DRAWING 91000-P-000-001
EAST KOOTENAY EXCHANGE (YAHK)
CANADA PIPELINES LIMITED

1.1.9.4 *Land Requirements*

The existing McPhee Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 LA, NPS 8 LA and NPS 10 RA. The NPS 6 LA is for Kimberley Lateral 168 while NPS 8 LA and NPS 10 RA are for Cranbrook Kimberley Loop 219 and Cranbrook Kimberley Loop 273, respectively. The current McPhee Station is 14.7 metres by 18.35 metres.

The NPS 8 RA for Cranbrook Kimberley Loop 219 will be located at the existing 6 Mile Road Station. It is 8.38 metres by 13.5 metres and is tentatively planned to be extended 5 metres to the North to accommodate the receiving barrel set.

1.1.9.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.9.6 *Deviation from Typical ILI Upgrade*

There are two deviations from typical ILI upgrades as following:

- The existing FortisBC McPhee Station will be expanded to be a shared site for Kimberley Lateral 168, Cranbrook Kimberley Loop 219 and Cranbrook Kimberley Loop 273 to accommodate one NPS 6 LA, one NPS 8 LA and one NPS 10 RA
- Kimberley Lateral 168 and Cranbrook Kimberley Loop 219 share ROW over the 4007 metres of length

1.1.9.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.9.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.9.9 *System Configuration Notes*

The Cranbrook Kimberley Loop 219 can utilize the McPhee Control Station for pressure control, and can be supplied at full tap pressure. Stopple-bypass requirement may be reduced for Cranbrook Kimberley Loop 219 during times Kimberley Lateral 168 can be utilized as a bypass.

1.1.9.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LRA to accommodate: the existing valve station piping configuration and the proposed shared sites configuration.

1.1.10 Lateral 28 – Kimberly Lateral 168 (KBY LTL 168)

The Kimberley Lateral 168, identified as Lateral 28 for this Project, has ILI selected as the preferred alternative.

1.1.10.1 *Existing System*

The NPS 6 diameter, 20,573 metre long Kimberley Lateral branches off at McPhee Station and ends approximately 2 kilometres south of Kimberley Gate Station where the pipe diameter transitions from NPS 6 to NPS 4. It shares the ROW with Cranbrook Kimberley Loop 219 over a length of 4007 metres. It crosses St. Mary River on an aerial bridge.

Table K-19: Existing KBY LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	20+573	NPS 6	1962

1.1.10.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on KBY LTL 168 require upgrade in order for the lateral to be ILI capable. The KBY LTL 168 upgrade requirements are indicated in Table K-20. The CVA is not required for this line as it can be pressure controlled at McPhee station. The NPS 6 LA will be installed at the existing FortisBC McPhee Station. The NPS 6 RA is planned to be located at the end of line, which is currently a green field.

All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

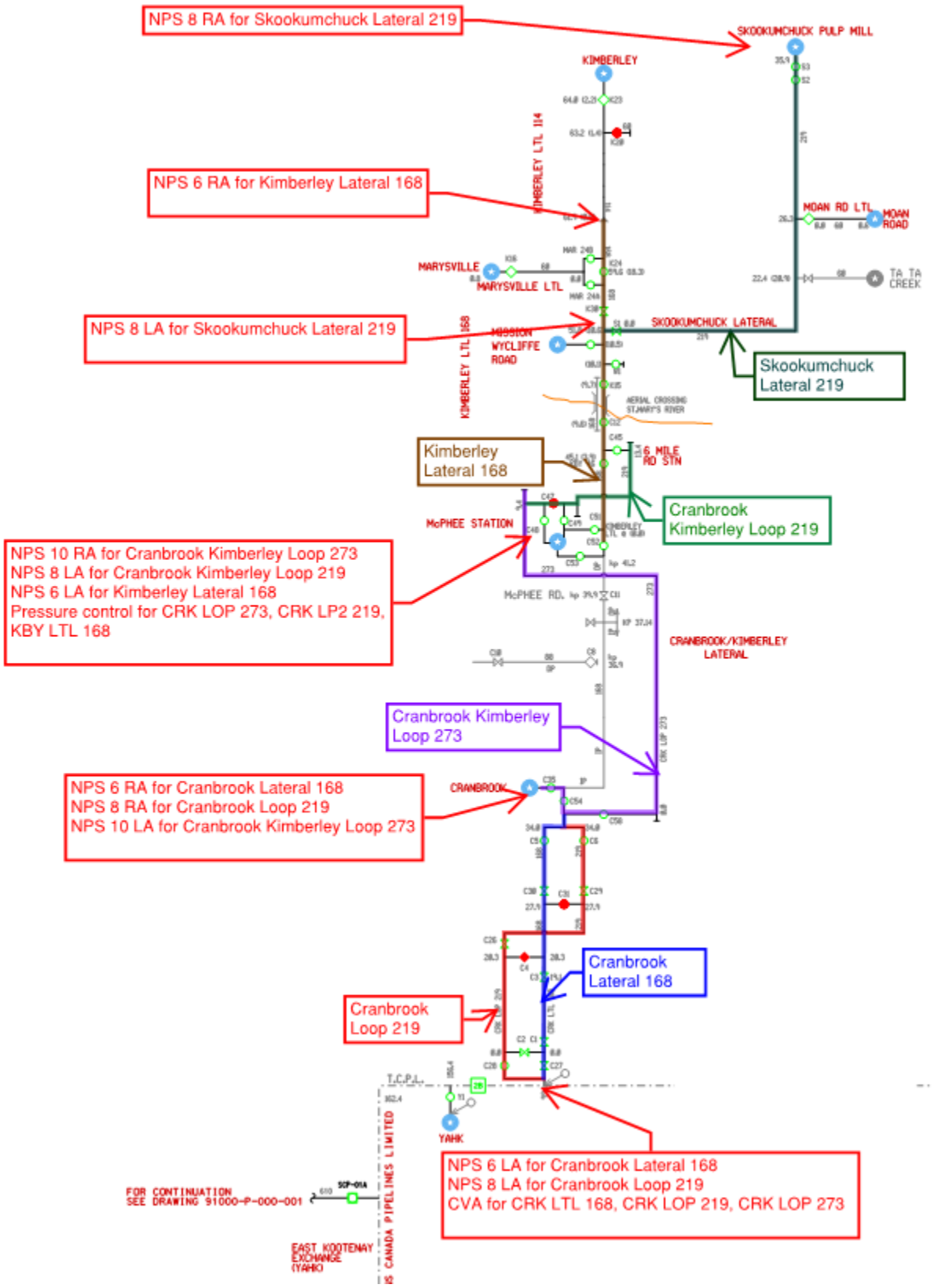
Table K-20: KBY LTL 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	0	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	5	Typical design
Elbow/Bend Replacements	NPS 6	7	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	5	
Receivers Assemblies (RA)	NPS 6	1	Typical design

Appurtenance Type	Mainline Size	# of Instances	Notes
Stopple Upgrades (SU)	NPS 6	9	
Pipe Segments	NPS 6	2 (27m,31m)	Estimated as two 70 m HD Bore crossings

1.1.10.3 *System Flow Schematic*

Figure K-10: KBY LTL 168 System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
NPS 6 RA for Kimberley Lateral 168
NPS 8 LA for Skookumchuck Lateral 219
Skookumchuck Lateral 219
Kimberley Lateral 168
Cranbrook Kimberley Loop 219
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
Cranbrook Kimberley Loop 273
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
SKOOKUMCHUCK LATERAL
MISSION WYCLIFFE ROAD
KIMBERLEY LTL 168
AERIAL CROSSING ST.MARY'S RIVER
6 MILE RD STN
McPHEE STATION
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
CRK LOP 273
CRANBROOK
T.C.P.L.
YAHK
CRK LTL
FOR CONTINUATION SEE DRAWING 91000-P-000-001
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1

1.1.10.4 *Land Requirements*

The existing McPhee Station will be expanded to accommodate the new additions of three (3) assembly sets: NPS 6 LA, NPS 8 LA and NPS 10 RA. The NPS 6 LA is for Kimberley Lateral 168 while NPS 8 LA and NPS 10 RA are for Cranbrook Kimberley Loop 219 and Cranbrook Kimberley 273, respectively. The current McPhee Station is 14.7 metres by 18.35 metres.

The NPS 6 RA for Kimberley Lateral 168 will be located at the point where the diameter transitions from NPS 6 to NPS 4. Currently there is a green field with a FortisBC stopple warning signage. There are overhead power lines right above the warning signage. The plan is to tentatively build a fenced site where the warning signage is located but move as far as possible from the overhead power lines.

1.1.10.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.10.6 *Deviation from Typical ILI Upgrade*

There are two deviations from typical ILI upgrades as following:

- The existing FortisBC McPhee Station will be expanded to be a shared site for Kimberley Lateral 168, Cranbrook Kimberley Loop 219 and Cranbrook Kimberley 273 to accommodate one NPS 6 LA, one NPS 8 LA and one NPS 10 RA
- Kimberley Lateral 168 and Cranbrook Kimberley Loop 219 share ROW over the 4007 metres of length

1.1.10.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.10.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.10.9 *System Configuration Notes*

The Kimberley Lateral can utilize the pressure control at the McPhee station, and can be supplied at full tap pressure.

1.1.10.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA and RA to accommodate: the existing valve station piping configuration and the proposed shared sites configuration.

1.1.11 Lateral 29 – Skookumchuck Lateral 219 (SSK LTL 219)

The Skookumchuck Lateral 219, identified as Lateral 29 for this Project, has ILI selected as the preferred alternative.

1.1.11.1 *Existing System*

The NPS 8 diameter, 35,931 metre long Skookumchuck Lateral branches off Kimberley Lateral 168 at the existing FortisBC Valve S1 Station and ends at Skookumchuck Pulp Mill Station.

Table K-21: Existing SSK LTL 219 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	35+931	NPS 8	1968

1.1.11.2 *Proposed ILI Modification Tally*

Several appurtenances (valves, fittings) on SSK LTL 219 require upgrade in order for the lateral to be ILI capable. The SSK LTL 219 upgrade requirements are indicated in Table K-22. The CVA is not required for this line since it would be able to utilize the McPhee Control Station. The NPS 8 LA will be installed at the existing FortisBC Valve S1 Station. The NPS 8 RA is planned to be located at the Skookumchuck Pulp Mill Station.

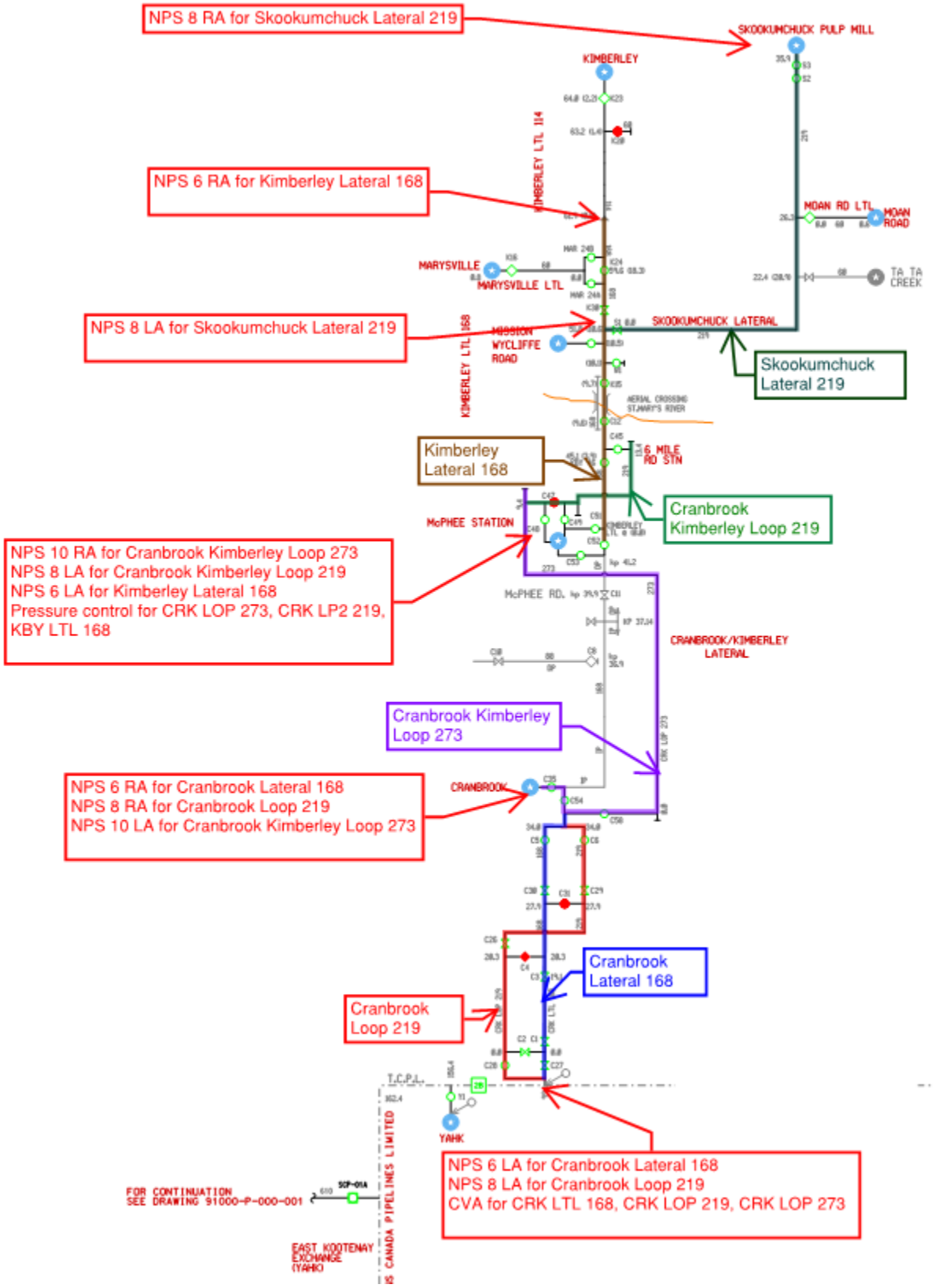
All appurtenance upgrades assume that all modifications are to be made while the pipeline is active in service using stopple hot taps and by-pass piping.

Table K-22: SSK LTL 219 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
Control Valve Assemblies (CVA)	NPS 6	0	Typical design, single CVA at CRK LTL serves entire Cranbrook system
Launchers Assemblies (LA)	NPS 6	1	Typical design
Main Line Valve Assemblies (MLVA)	NPS 6	0	
Elbow/Bend Replacements	NPS 6	1	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	0	
Receivers Assemblies (RA)	NPS 6	1	Typical design
Stopple Upgrades (SU)	NPS 6	4	
Pipe Segments	NPS 6	0	None

1.1.11.3 *System Flow Schematic*

Figure K-11: SSK LTL 219 System Flow Schematic


NPS 8 RA for Skookumchuck Lateral 219
NPS 6 RA for Kimberley Lateral 168
NPS 8 LA for Skookumchuck Lateral 219
Skookumchuck Lateral 219
Kimberley Lateral 168
Cranbrook Kimberley Loop 219
NPS 10 RA for Cranbrook Kimberley Loop 273
NPS 8 LA for Cranbrook Kimberley Loop 219
NPS 6 LA for Kimberley Lateral 168
Pressure control for CRK LOP 273, CRK LP2 219, KBY LTL 168
Cranbrook Kimberley Loop 273
NPS 6 RA for Cranbrook Lateral 168
NPS 8 RA for Cranbrook Loop 219
NPS 10 LA for Cranbrook Kimberley Loop 273
Cranbrook Lateral 168
Cranbrook Loop 219
NPS 6 LA for Cranbrook Lateral 168
NPS 8 LA for Cranbrook Loop 219
CVA for CRK LTL 168, CRK LOP 219, CRK LOP 273
SKOOKUMCHUCK PULP MILL
KIMBERLEY
KIMBERLEY LTL 114
MOAN RD LTL
MOAN ROAD
MARYSVILLE
MARYSVILLE LTL
TA TA CREEK
SKOOKUMCHUCK LATERAL
MISSION WYCLIFFE ROAD
KIMBERLEY LTL 168
AERIAL CROSSING ST.MARY'S RIVER
6 MILE RD STN
McPHEE STATION
McPHEE RD.
CRANBROOK/KIMBERLEY LATERAL
CRANBROOK
T.C.P.L.
YAHK
FOR CONTINUATION SEE DRAWING 91000-P-000-001
EAST KOOTENAY EXCHANGE (YAHK)
CANADA PIPELINES LIMITED

1.1.11.4 *Land Requirements*

The existing FortisBC Valve S1 Station will be expanded to accommodate the new addition of the NPS 8 launcher assembly. The current fenced site of Valve S1 station is 13.5 metres by 7.2 metres.

The NPS 8 RA for Skookumchuck Lateral 219 will be located at the end of line. Currently there is an existing fenced site next to Skookumchuck Pulp Mill. The plan is to extend the fenced site to accommodate the RA.

1.1.11.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.1.11.6 *Deviation from Typical ILI Upgrade*

There are not any deviations from Typical ILI upgrade.

1.1.11.7 *Noteworthy Pipe Additions*

The configuration of CVA and LA may require some minor pipe additions, but will not result in a change of scope.

1.1.11.8 *Pipe Diameter Changes*

The pipe diameter does not change.

1.1.11.9 *System Configuration Notes*

The pressure control would be applied from McPhee Control Station for this lateral, and can be supplied full tap pressure.

1.1.11.10 *Modifications to Typical LA/RA/CVA*

There will be alterations of inlet and outlet piping, as well as the kicker line piping, from the typical LA and RA to accommodate the existing valve station piping configuration.

1.2 *DESCRIPTION OF TRANSMISSION LATERALS WITH PRS AS PREFERRED ALTERNATIVE*

There are a total of 14 lateral systems where an upgrade with a Pressure Regulating Station (PRS) was the preferred alternative. Below is a detailed Project description for each lateral system with the required upgrades discussed in Section 5.2.2.

1.2.1 Lateral 4 – Prince George Lateral 219 (PG3 LTL 219)

The Prince George 3 Lateral 219, identified as Lateral 4 for this Project, the Northwood Pulp Lateral 168, identified as Lateral 5 for this Project and the Northwood Pulp Lateral 219, identified as Lateral 6 for this Project, have a PRS installation selected as the preferred alternative. There will be one single PRS shared by these three laterals.

1.2.1.1 *Existing System*

The NPS 6 diameter, 6,042 metres long, Northwood Pulp Lateral (NWP LTL 168) and its loop line, NPS 8 diameter, 5,868 metres long, Northwood Pulp Loop (NWP LOP 219) originate at Enbridge Westcoast Pipeline tap at KP 363.7 – Northwood Site, just north of the Fraser River crossing.

Both the lateral and the loop are tied to Hanet Road Gate Station 10477 at approximately KP 0+650 and continue (in separate ROWs for most of their length) to tie-in to PG3 LTL 168. While NWP LOP 219 ties to PG3 LTL 168 entirely, NWP LTL 168 ties to PG3 LTL 168 with crossover piping and continues for another ~340 metres to supply the Northwood Pulp Mill.

The NPS 6 Prince George 3 Lateral, 5,345 metres long, terminates at Noranda Road Gate Station.

The PG3 LTL 168 has a Maximum Operation Pressure of 7,414 kPa by design and the current Certified Operation Pressure is 6,453 kPa. The NWP LTL 168 has a Maximum Operation Pressure of 7,011 kPa by design and the current Certified Operation Pressure is 6,619 kPa. The NWP LOP 219 has a Maximum Operation Pressure of 7,416 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-23: Existing PG3 LTL 219 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	5+345	NPS 8	1970

Table K-24: Existing NWP LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+053	5+989	NPS 6	1965

Table K-25: Existing NWP LOP 219 Segments

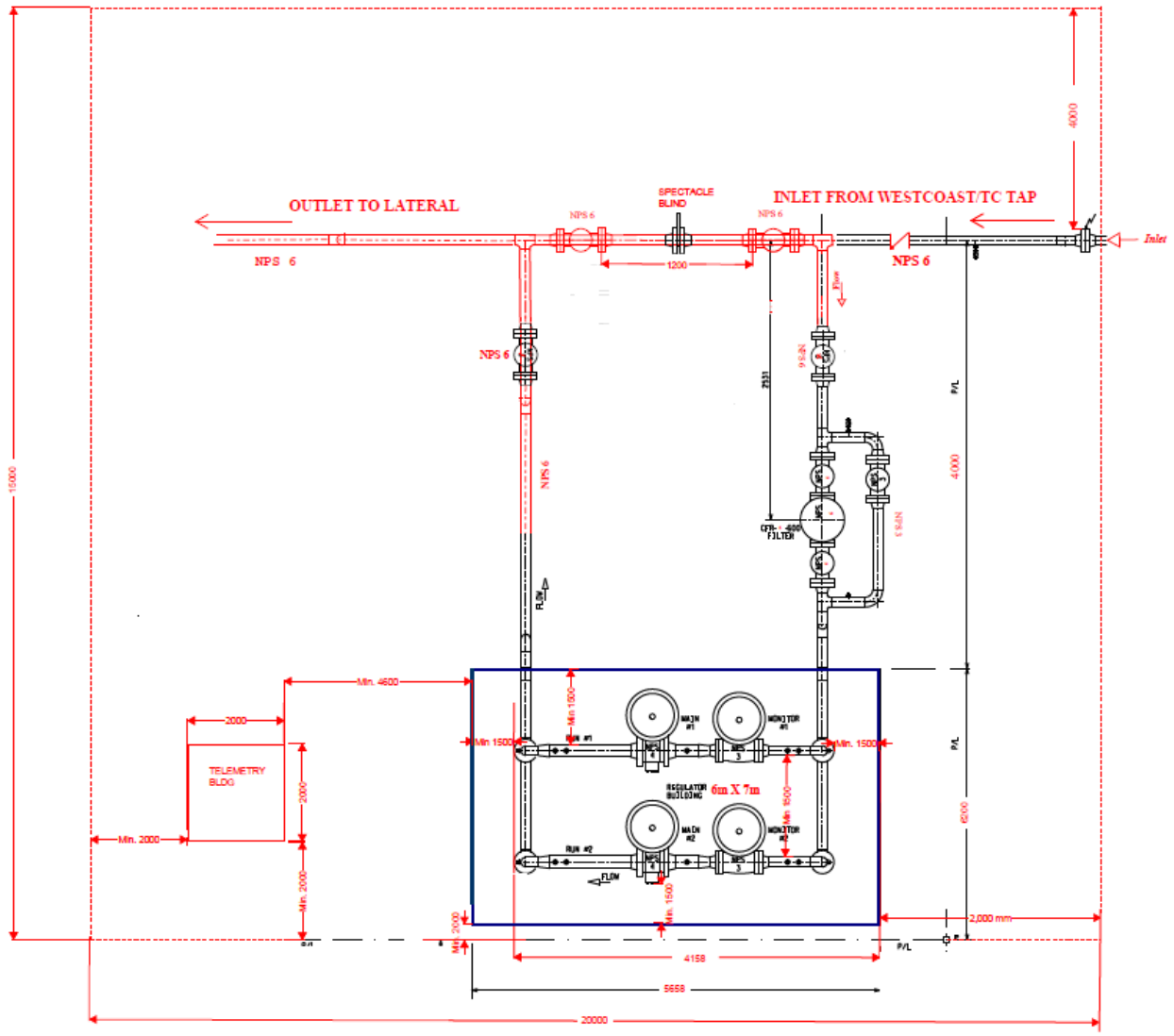
From KP	To KP	Diameter	Predominant Year of Construction
0+045	5+823	NPS 8	1995

1.2.1.2 *Proposed Pressure Regulating Station*

For PG3 LTL 168, NWP LTL 168 and NWP LOP 219, the pressure will be regulated to 4,153 kPa. FortisBC System Capacity Planning has determined that these three laterals will continue to meet firm and interruptible industrial customer demand beyond 2038 at this regulated pressure.

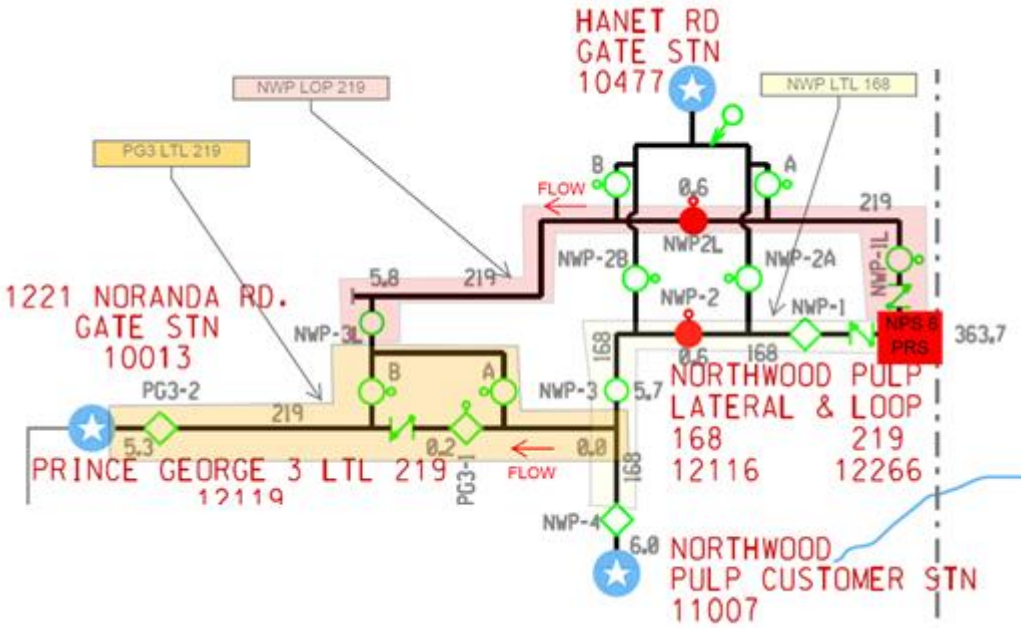
Refer to Figure K-12 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-12: Proposed NWP LTL 168 PRS Site Layout



1.2.1.3 *System Flow Schematic*

Figure K-13: NWP LTL 168, NWP LOP 219, PG3 LTL 219 System Flow Schematic



1.2.1.4 *Land Requirements*

For PG3 LTL 168, NWP LTL 168 and NWP LOP 219, the new shared NPS 6 PRS will be installed within the existing Enbridge Northwood site at the north end of Enbridge Westcoast Pipeline Fraser River aerial crossing. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.1.5 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.1.6 *Deviation from Typical Pressure Regulating Station Design*

There is no noteworthy deviation from the typical PRS design at this site.

1.2.1.7 *System Configuration Notes*

A single PRS will be installed upstream of both the NWP LTL 168 and NWP LOP 219 laterals, providing the required pressure regulation for PG3 LTL 168 as well.

1.2.2 Lateral 5 – Northwood Pulp Lateral 168 (NWP LTL 168)

The Prince George 3 Lateral 219, identified as Lateral 4 for this Project, the Northwood Pulp Lateral 168, identified as Lateral 5 for this Project and the Northwood Pulp Lateral 219, identified as Lateral 6 for this Project, have a PRS installation selected as the preferred alternative. There will be one single PRS shared by these three laterals.

Please refer to Section 1.2.1 for Project Details for Lateral 5.

1.2.3 Lateral 6 – Northwood Pulp Loop 219 (NWP LOP 219)

The Prince George 3 Lateral 219, identified as Lateral 4 for this Project, the Northwood Pulp Lateral 168, identified as Lateral 5 for this Project and the Northwood Pulp Lateral 219, identified as Lateral 6 for this Project, have a PRS installation selected as the preferred alternative. There will be one single PRS shared by these three laterals.

Please refer to Section 1.2.1 for Project Details for Lateral 6.

1.2.4 Lateral 8 – Prince George Pulp Lateral 168 (PGP LTL 168)

The Prince George Pulp Lateral 168, identified as Lateral 8 for this project and the Husky Lateral 168, identified as Lateral 9 for this project, have a Pressure Regulating Station (PRS) installation selected as the Preferred Alternative. There will be one single PRS shared by these two laterals.

1.2.4.1 *Existing System*

The NPS 6 diameter, 1010 metres long, Prince George Pulp Lateral (PGP LTL 168) connects Prince George #1 Lateral 168 and Husky Lateral 168, supplying Canfor Pulp Mill. Currently the lateral crosses the Fraser River by suspending the pipe from the CN railway bridge. Canfor Pulp Mill, one of the large industrial customers, is supplied by Prince George Pulp Lateral 168. The NPS 6, 4, 3 and 2 diameter, 2220 metre long Husky Lateral is supplied by PGP lateral and serves Husky Oil Customer Station, Pulpmill Road Gate Station and FMC Customer Station. Husky Lateral has noticeable land constraints and schedule restrictions imposed by large industrial customers. The westbound portion of pipeline (beyond ~ KP 0+639) runs within a road allowance, where FortisBC has no ROW. It's bound by the road and a buried NPS 42 diameter water pipeline on the south side and Husky facility on the north side.

The PGP LTL 168 has a Maximum Operating Pressure (MOP) of 6,619 kPa by design and the current Certified Operation Pressure (COP) is 6,453 kPa. The HUS LTL 168 has a Maximum Operation Pressure (MOP) of 6,619 kPa by design and the current Certified Operation Pressure (COP) is 6,453 kPa.

Table K-26: Existing PGP LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+001	1+010	NPS 6	1964

Table K-27: Existing HUS LTL 168 Segments

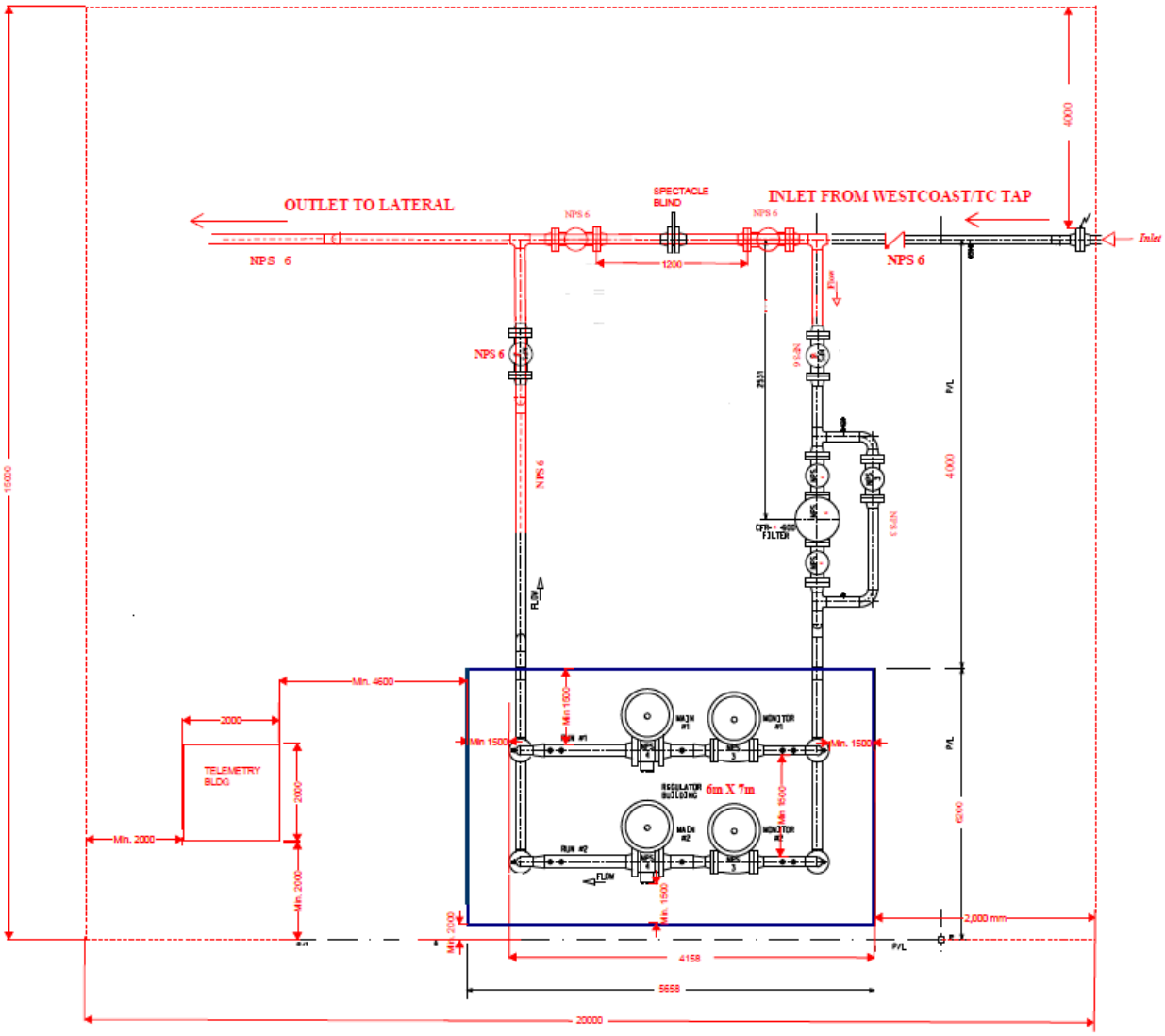
From KP	To KP	Diameter	Predominant Year of Construction
0+000	1+113	NPS 6	1967
1+113	2+215	NPS 4	1993
2+215	2+218	NPS 3 (not in scope)	1993
2+218	2+220	NPS 2 (not in scope)	1993
0+000	1+113	NPS 6	1967

1.2.4.2 *Proposed Pressure Regulating Station (PRS)*

For PGP LTL 168 and HUS LTL 168, the pressure will be regulated to 4,946 kPa, which FortisBC System Capacity Planning has determined that these two laterals will continue to meet firm customer demand beyond 2038 at this regulated pressure.

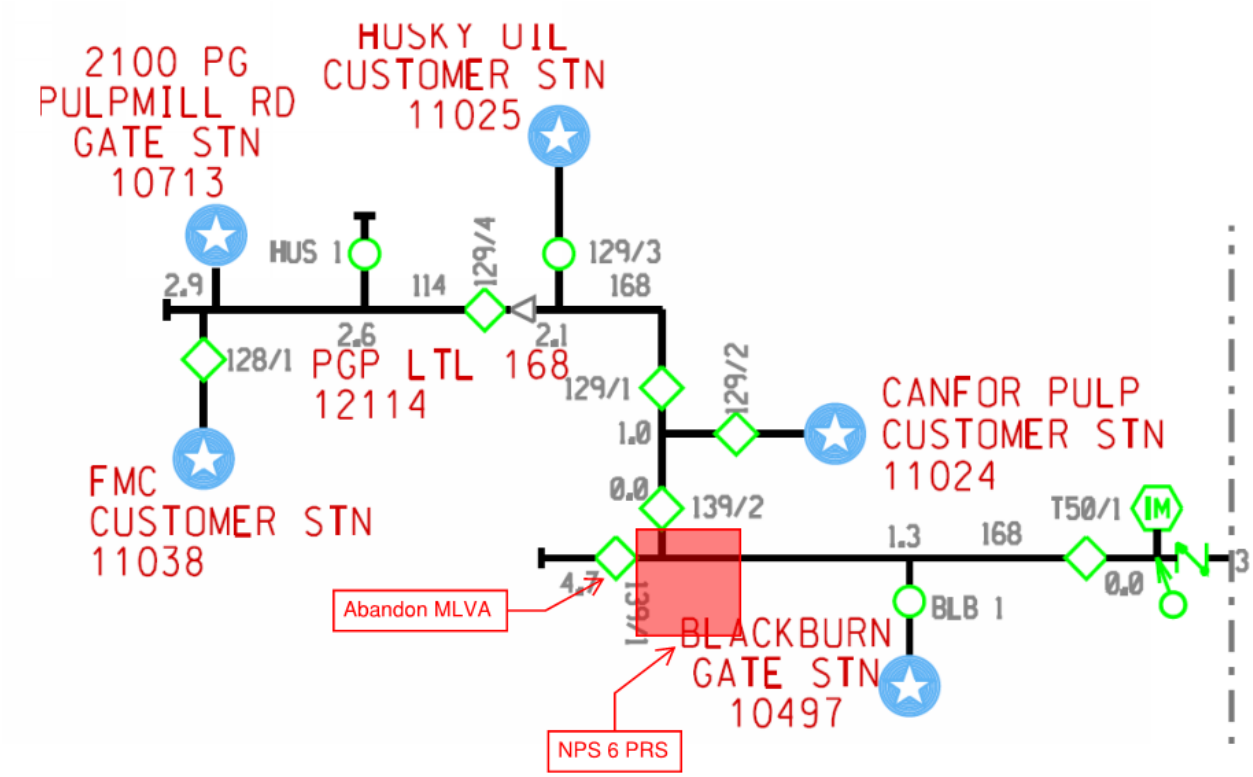
Refer to Figure K-14 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing existing valves and piping as bypass.

Figure K-14: Proposed PGP LTL Site Layout Sketch



1.2.4.3 *System Flow Schematic*

Figure K-15: PGP LTL 168 Flow Schematic



1.2.4.4 *Land Requirements*

For PGP LTL 168 and HUS LTL 168, the new shared NPS 6 PRS will be installed at the end of PG1 lateral. The facility will likely house both the PRS and the RA from PG1 LTL 168. The existing MLVA on PGP is in the proximity of CN railway corridor, which poses access difficulty. The tentative plan is to abandon existing MLVA in place and locate the PRS east of the CN railway on the south bank of Fraser River. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.4.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.4.6 *Deviation from Typical Pressure Regulating Station*

The proposed PRS will have to integrate with the receiver barrel of the PG1 LTL on the same site.

1.2.4.7 *System Configuration Notes*

A single NPS 6 PRS will be installed upstream of both, PGP LTL 168 and HUS LTL 168, providing the required pressure regulation.

1.2.5 Lateral 9 – Husky Oil Lateral 168 (HUS LTL 168)

The Prince George Pulp Lateral 168, identified as Lateral 8 for this project and the Husky Lateral 168, identified as Lateral 9 for this project, have a Pressure Regulating Station (PRS) installation selected as the Preferred Alternative. There will be one single PRS shared by these two laterals.

Please refer to Section 1.2.4 for Project Details for Lateral 9.

1.2.6 Lateral 10 – Prince George 2 Lateral 219 (PG2 219/168)

The Prince George 2 Lateral 219 168, identified as Lateral 10 for this Project, has a PRS installation selected as the preferred alternative.

1.2.6.1 *Existing System*

The Prince George 2 Lateral (PG2 219 168) originates at Enbridge Westcoast Pipeline tap at KP 380, just southeast of Prince George Airport. It is comprised of 4,028 metres of NPS 8 diameter and 4,631 metres of NPS 6 diameter segments. The changeover from NPS 8 to NPS 6 is at the take-off to Johnson Road Gate Station 10696. The NPS 6 segment terminates at Hwy 97 & Hwy 26 Gate Station 10028.

The PG2 219 168 has a Maximum Operation Pressure of 7,904/8,895 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-28: Existing PG2 LTL 219/168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+009	4+019	NPS 8	2007
4+019	8+650	NPS 6	1965

1.2.6.2 *Proposed Pressure Regulating Station*

For PG2 219 168, the pressure will be regulated to 4,703 kPa. FortisBC System Capacity Planning has determined that PG2 219 168 will continue to meet firm customer demand beyond 2038 at this regulated pressure.

Refer to Figure K-16 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-16: Proposed PG2 LTL 219/168 PRS Site Layout

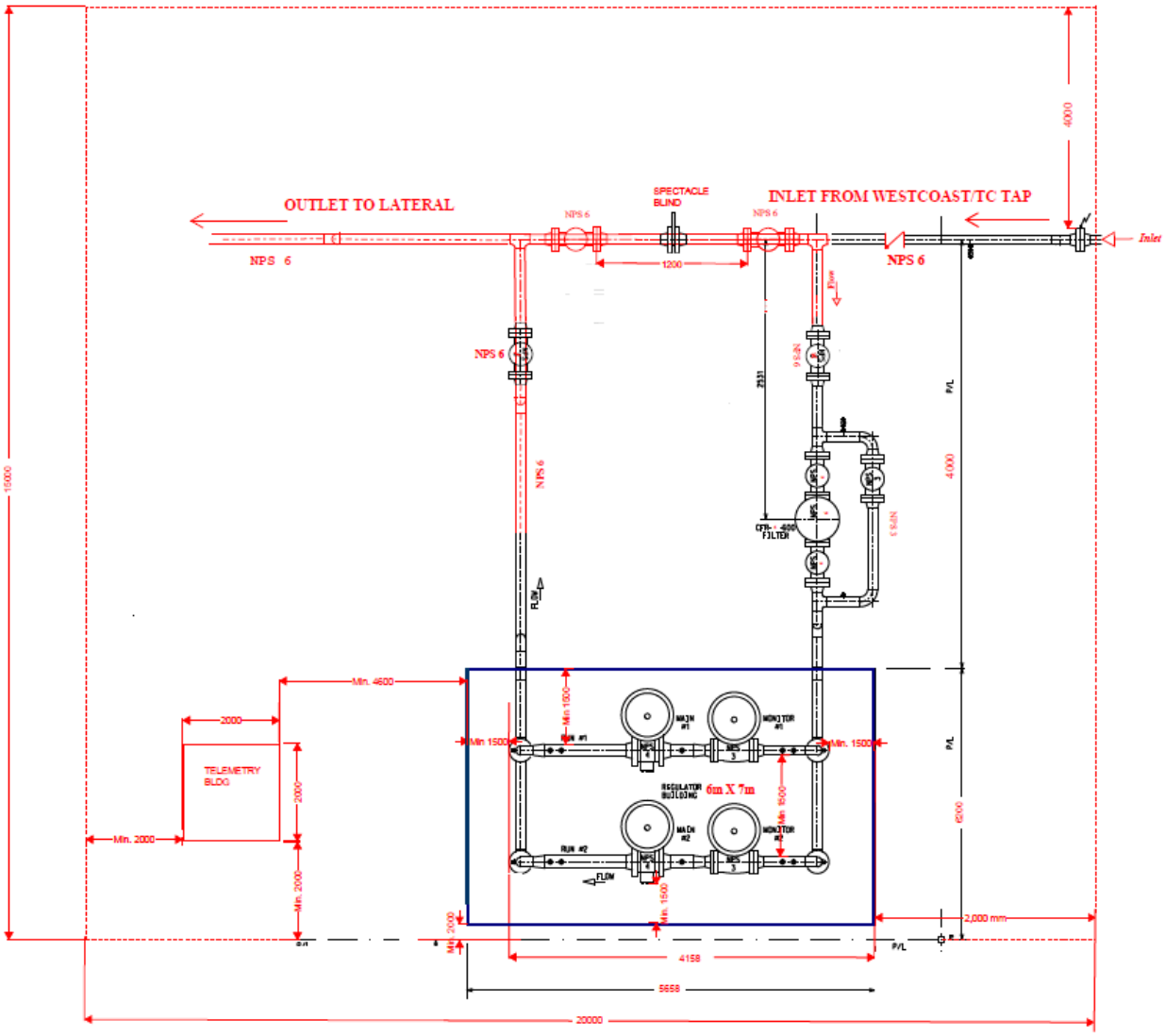
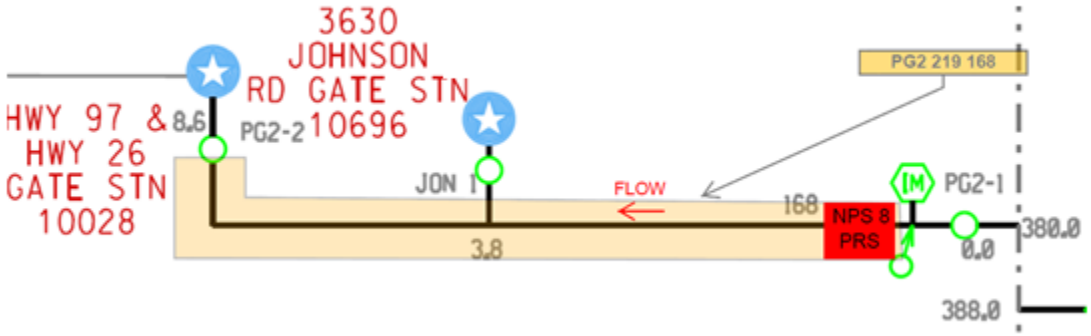


Figure K-17: Proposed PG2 LTL 219/168 System Flow Schematic



1.2.6.3 *Land Requirements*

For PG2 219 168, the new NPS 8 PRS will be installed on a new lease just west to the existing Enbridge metering facility. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.6.4 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.6.5 *Deviation from Typical Pressure Regulating Station Design*

The proposed PRS will have to integrate with the existing buildings on site and expand the footprint as required.

1.2.6.6 *System Configuration Notes*

The PRS will be installed upstream of the PG2 219 168 lateral to provide the desired pressure regulation on the system.

1.2.7 Lateral 12 – Williams Lake Loop 168 (WIL LP1 & LP2 168)

The Williams Lake Loop 168, identified as Lateral 12 for this Project, has a PRS installation selected as the preferred alternative.

1.2.7.1 *Existing System*

The NPS 6 diameter Williams Lake Loop, 2,551 metres long WIL LP2 168 segment and 3,385 long WIL LP1 168 segment, are loops of the Williams Lake Lateral (WIL LTL 114). Both WIL LTL 114 and WIL LP2 168 originate at Enbridge Westcoast Pipeline tap at KP 581.8, just northwest of Williams Lake Airport. WIL LP2 168 terminates at Williams Lake Airport Gate Station and it is within 15 metres where WIL LP1 168 starts. WIL LP1 168 terminates at the Northwest Energy Lateral 114 take-off. There is approximately 15 metres long discontinuity between WIL LP2 168 and WIL LP1 168 at Williams Lake Airport Gate Station.

The WIL LP2 168 has a Maximum Operation Pressure of 8,480 kPa by design and the current Certified Operation Pressure is 6,619 kPa. The WIL LP1 168 has a Maximum Operation Pressure of 7,921 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-29: Existing WIL LP1 & LP2 168 Segments

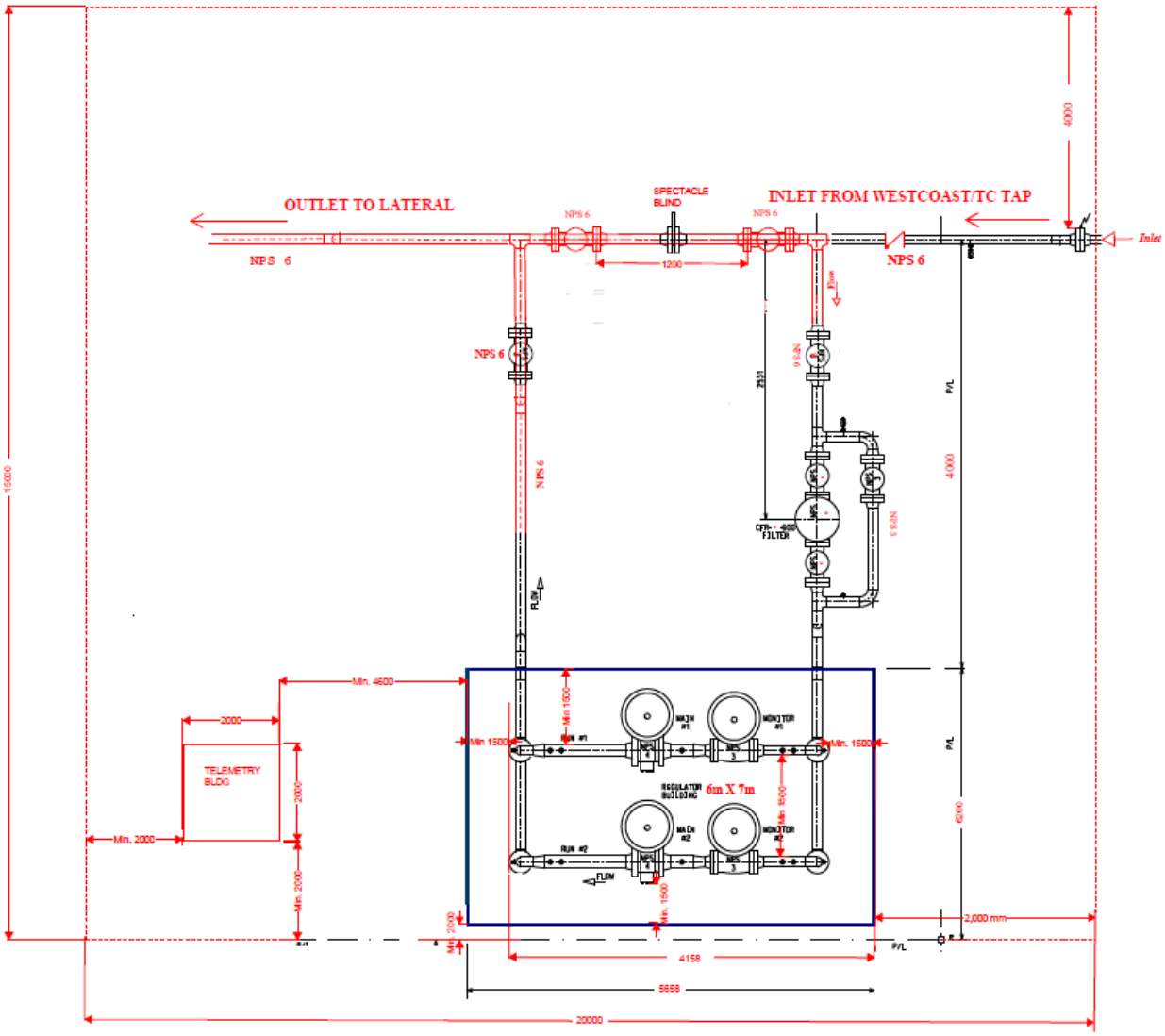
From KP	To KP	Diameter	Predominant Year of Construction
0+036	2+551	NPS 6	1998
2+562	5+947	NPS 6	1993

1.2.7.2 *Proposed Pressure Regulating Station*

For WIL LP1 & LP2 168, the pressure will be regulated to 4,110 kPa. FortisBC System Capacity Planning has determined that WIL LP1 & LP2 168 will continue to meet firm an interruptible industrial customer demand beyond 2038 at this regulated pressure.

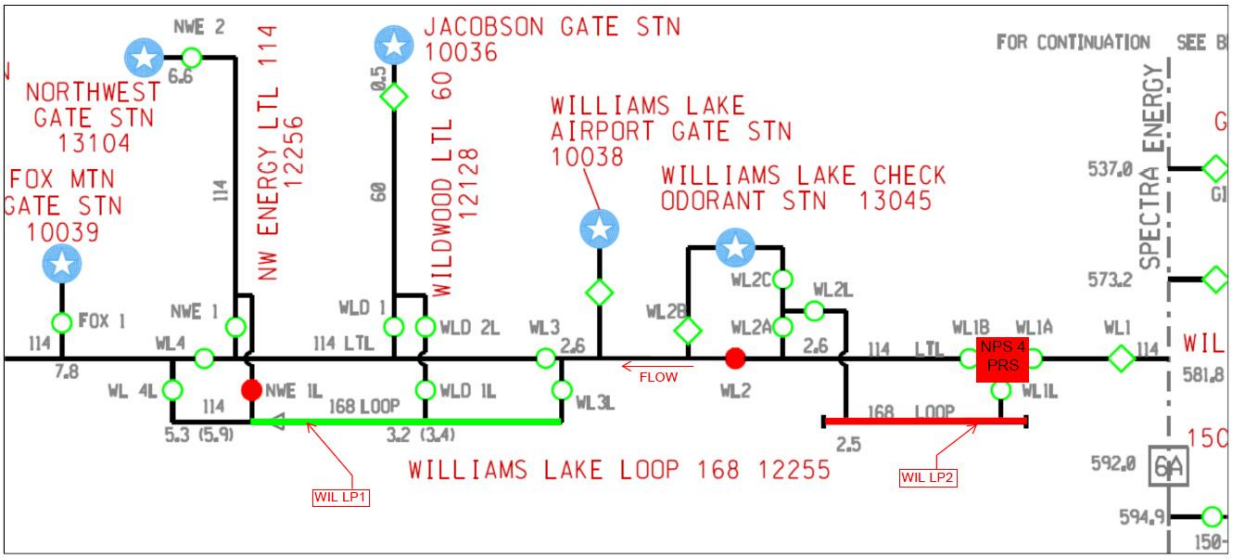
Refer to Figure K-18 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-18: Proposed WIL LP1 & LP2 168 PRS Site Layout



1.2.7.3 *System Flow Schematic*

Figure K-19: Williams Lake LP1 & LP2 168 System Flow Schematic



1.2.7.4 *Land Requirements*

For WIL LP1 & LP2 168 laterals, the PRS will be installed on WIL LTL 114 within the existing Enbridge metering facility lease area. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.7.5 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.7.6 *Deviation from Typical Pressure Regulating Station Design*

There is no noteworthy deviation from the typical PRS design at this site.

1.2.7.7 *System Configuration Notes*

The PRS will be installed on Williams Lake Lateral 114 (WIL LTL 114) to regulate the pressure for WIL LTL 114 and WIL LP1 & LP2 168 lines.

1.2.8 Lateral 16 – Coldstream Lateral 219 (COL LTL 219)

The Coldstream Lateral 219, identified as Lateral 16 for this Project, has a PRS installation selected as the preferred alternative.

1.2.8.1 *Existing System*

The NPS 8 diameter, 1,822 metre long Coldstream Lateral (COL LTL 219) initiates at Coldstream #1 Valve Station and terminates at Polson Drive Gate Station 10508. The feed to COL LTL 219 comes from COL LTL 114 and COL LOP 168 (Lateral 17).

The COL LTL 219 has a Maximum Operation Pressure of 6,619 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-30: Existing COL LTL 219 Segments

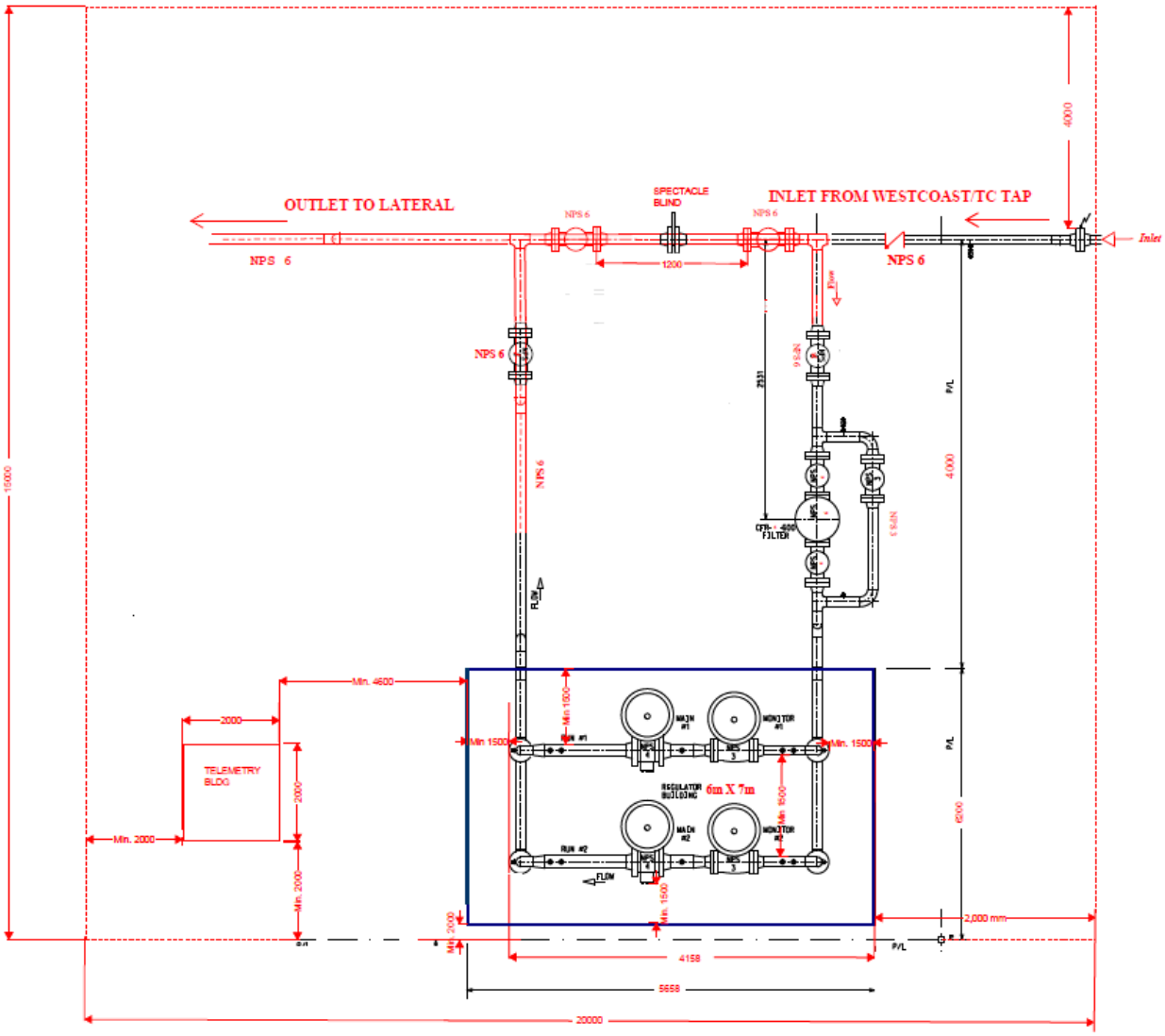
From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+009	NPS 8, Valve Station	1998
0+009	1+822	NPS 8	1998

1.2.8.2 *Proposed Pressure Regulating Station*

For COL LTL 219, the pressure will be regulated to 3,799 kPa. FortisBC System Capacity Planning has determined that COL LTL 219 will continue to meet firm customer demand beyond 2038 at this regulated pressure.

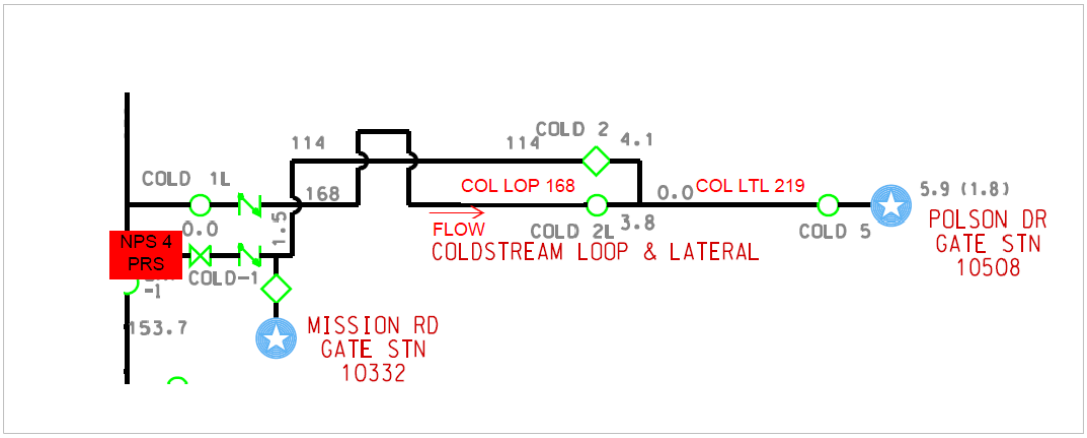
Refer to Figure K-20 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation utilizing stopple hot taps and by-pass piping.

Figure K-20: Proposed COL LTL 219 PRS Site Layout



1.2.8.3 *System Flow Schematic*

Figure K-21: COL LTL 219 Flow Schematic



1.2.8.4 *Land Requirements*

For COL LTL 219, the new NPS 4 PRS will be installed on COL LTL 114, on a new lease at the Savona-Nelson Mainline KP 151+121.7 take-off. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.8.5 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.8.6 *Deviation from Typical Pressure Regulating Station Design*

There is a below ground valve assembly that will be replaced as part of the PRS installation.

1.2.8.7 *System Configuration Notes*

In order to provide pressure regulation on COL LTL 219, both upstream laterals (COL LTL 114 and COL LOP 168) have to have the PRS alternative installed. The PRS will be installed upstream on the COL LTL 114 and see Section 5.3.3.8 – Lateral 17 – Coldstream Loop 168 (COL LOP 168) for PRS on COL LOP 168.

1.2.9 Lateral 17 – Coldstream Loop 168 (COL LOP 168)

The Coldstream Loop 168, identified as Lateral 17 for this Project, has a PRS installation selected as the preferred alternative.

1.2.9.1 *Existing System*

The NPS 6 diameter, 3,771 metre long Coldstream Loop (COL LOP 168) branches off the NPS 12 Savona Penticton Pipeline at KP 150+170.6, southwest of the city of Vernon. It terminates at Coldstream #1 Valve Station.

The COL LOP 168 has a Maximum Operation Pressure of 8,605 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-31: Existing COL LOP 168 Segments

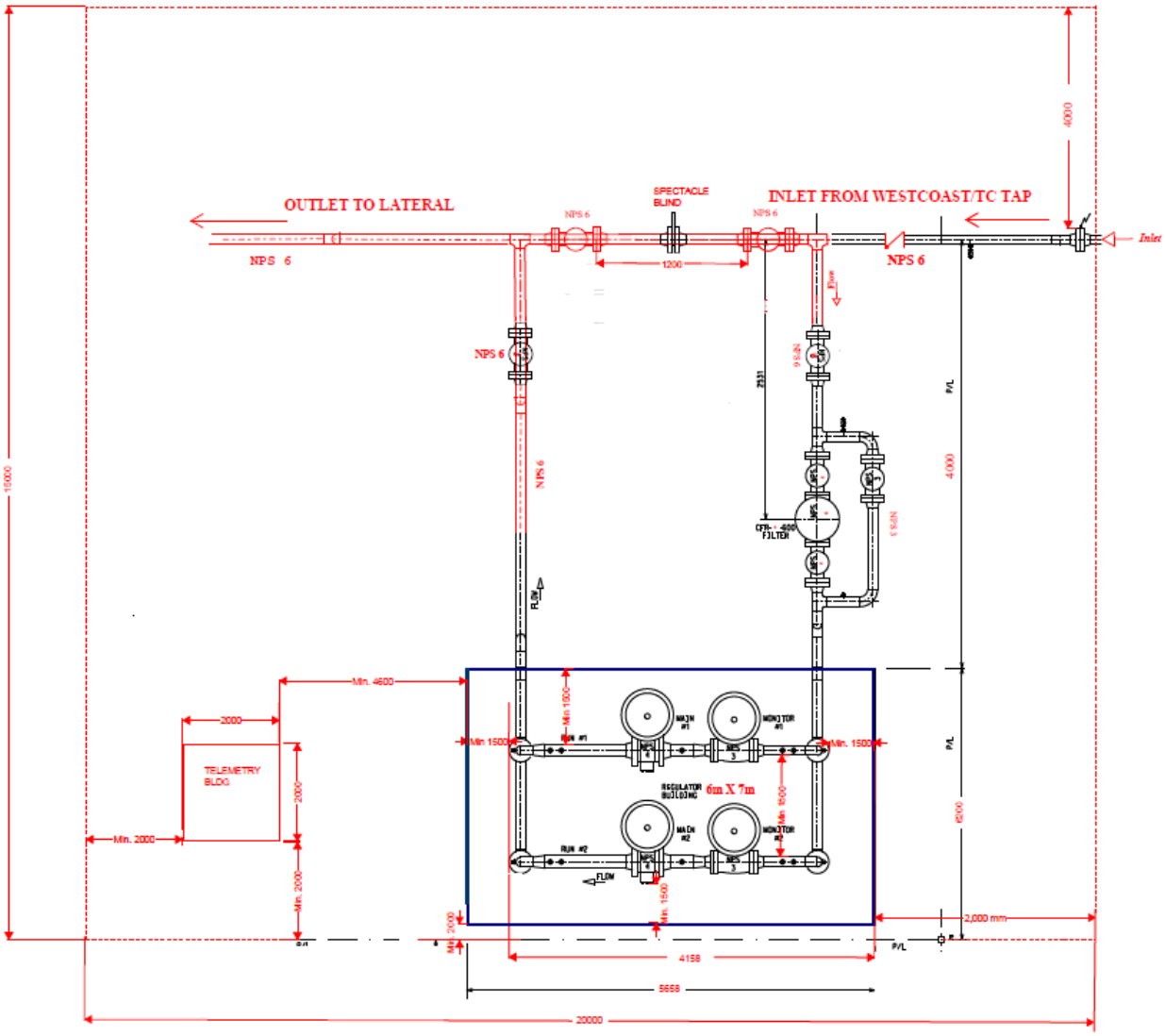
From KP	To KP	Diameter	Predominant Year of Construction
0+000	3+674	NPS 6	1989
3+674	3+771	NPS 6, Valve Station	1998

1.2.9.2 *Proposed Pressure Regulating Station*

For COL LOP 168, the pressure will be regulated to 3,799 kPa, which FortisBC System Capacity Planning has determined that COL LOP 168 will continue to meet firm customer demand beyond 2038 at this regulated pressure.

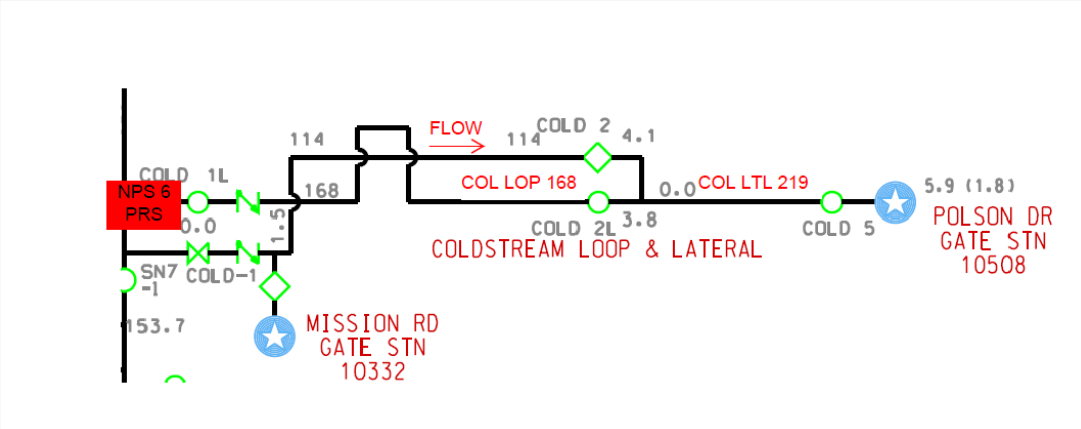
Refer to Figure K-22 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-22: Proposed COL LOP 168 PRS Site Layout



1.2.9.3 *System Flow Schematic*

Figure K-23: COL LOP 168 System Flow Schematic



1.2.9.4 *Land Requirements*

For COL LOP 168, the new NPS 6 PRS will be installed on a new lease at Savona-Nelson Mainline KP 150+170.6 take-off. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.9.5 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.9.6 *Deviation from Typical Pressure Regulating Station Design*

There is no noteworthy deviation from the typical PRS design on this site.

1.2.9.7 *System Configuration Notes*

The PRS will be installed upstream of the COL LOP 168 to provide the desired pressure regulation on the system.

1.2.10 Lateral 18 – Kelowna 1 Loop 219 (KE1 LOP 219)

The Kelowna 1 Loop 219, identified as Lateral 18 for this Project, has a PRS installation selected as the preferred alternative.

1.2.10.1 *Existing System*

The NPS 8 diameter, 2,109 metre long Kelowna 1 Loop (KE1 LOP 219) branches off the NPS 12 Savona Penticton Pipeline, in the city of Kelowna, BC. At this take-off location, there is an

existing FortisBC fenced facility called SN-9 Valve Station. The KE1 LOP 219 shares ROW with the Kelowna Lateral 114.

The KE1 LOP 219 has a Maximum Operation Pressure of 7,419/6,624 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-32: Existing KE1 LOP 219 Segments

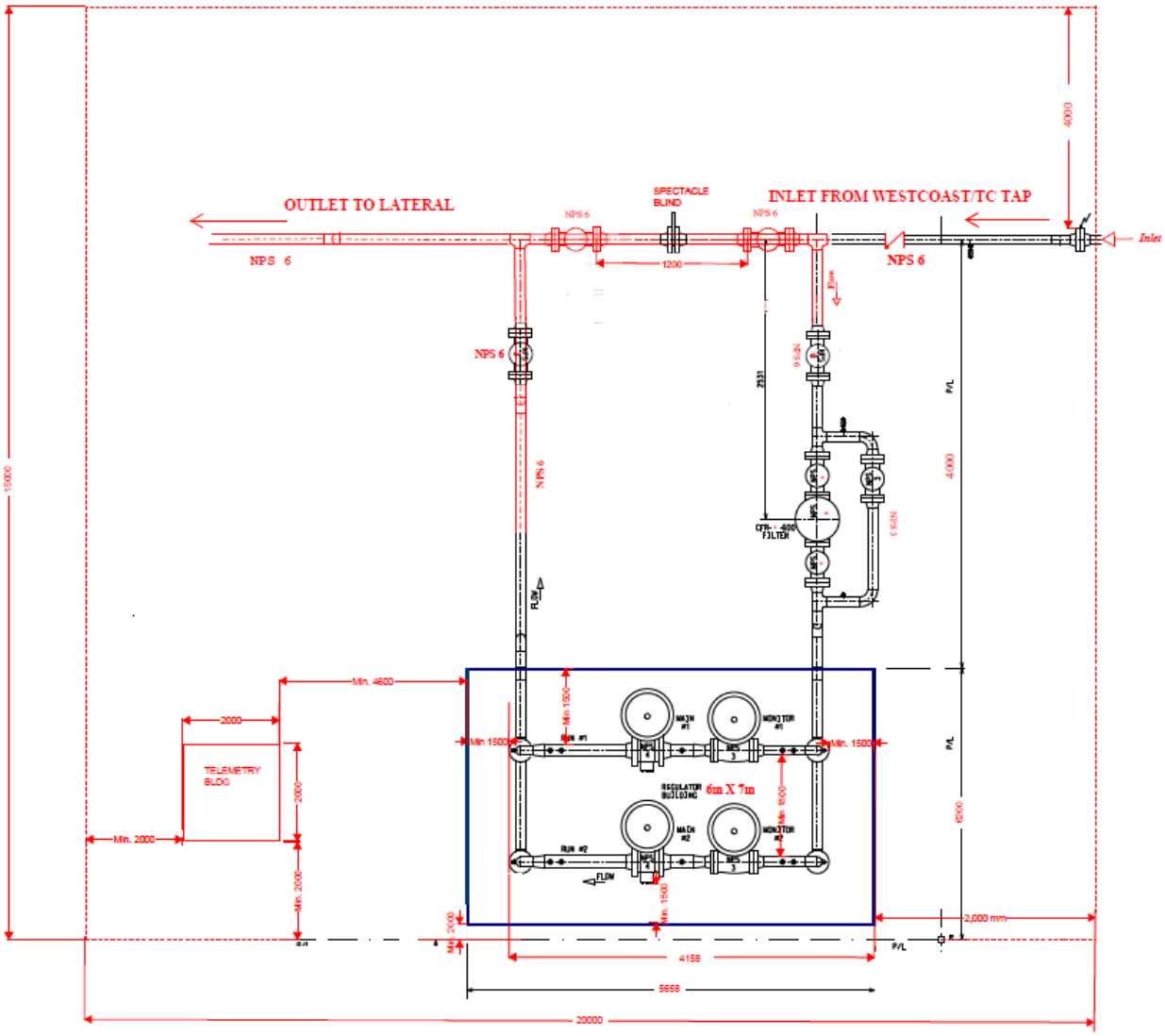
From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+034	NPS 6, Valve Station	2004
0+034	0+190	NPS 8	1999
0+190	0+479	NPS 8	2001
0+479	2+107	NPS 8	1976
2+107	2+109	NPS 6 Valve Station	1997

1.2.10.2 *Proposed Pressure Regulating Station*

For KE1 LOP 219, the pressure will be regulated to 3,799 kPa, which FortisBC System Capacity Planning has determined that KE1 LOP 219 will continue to meet firm customer demand beyond 2038 at this regulated pressure.

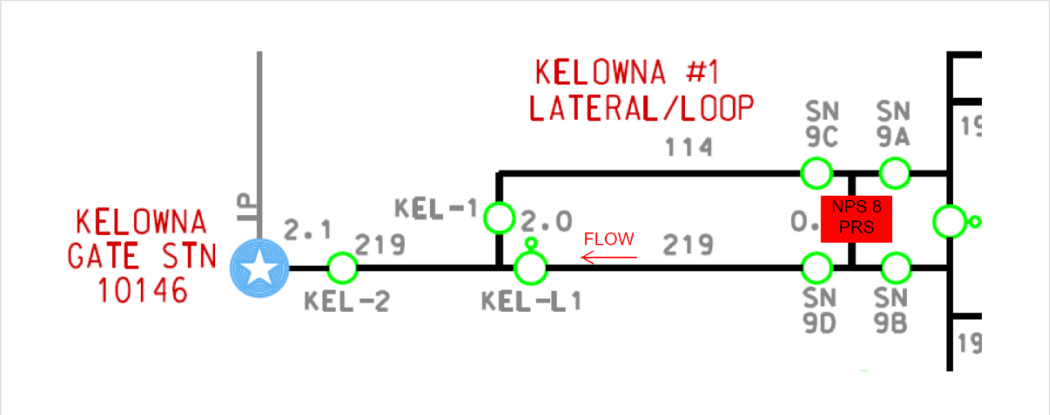
Refer to Figure K-24 for the proposed PRS layout at SN-9. The new PRS will be tied-in while KE1 LOP 219 and Kelowna 1 Lateral 114 are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-24: Proposed KE1 LOP 219 PRS Site Layout



1.2.10.3 *System Flow Schematic*

Figure K-25: KE1 LOP 219 System Flow Schematic



1.2.10.4 *Land Requirements*

For KE1 LOP 219, the new PRS will be installed within the existing SN-9 Valve Station. The tentatively new land requirement is approximately 20.0 x 15.0 metres but will be determined during detailed design.

1.2.10.5 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.10.6 *Deviation from Typical Pressure Regulating Station Design*

The proposed design is to install the PRS at the existing SN-9 Station. This PRS assembly will be site specifically designed to minimize land use, as the existing SN-9 valve facility is situated within Kelowna on the edge of corner of Walmart parking lot and space is limited. The control valve components will be housed within a building at this location depending on municipality permit approval for either accepting or rejecting building on this site.

1.2.10.7 *System Configuration Notes*

A single PRS will be installed upstream of both the Kelowna 1 Loop 219 and Kelowna 1 Lateral 114, so pressure regulating will be provided for both systems.

1.2.11 Lateral 19 - Celgar Lateral 168 (CEL LTL 168)

The Celgar Lateral 168, identified as Lateral 19 for this Project, has PRS selected as the preferred alternative.

1.2.11.1 *Existing System*

The NPS 6 diameter, 5,783 metre long Celgar Lateral 168 branches off the NPS 8 diameter Trail Castlegar Pipeline and supplies Celgar Pulp Mill. The CEL LTL 168 has a Maximum Operation Pressure (MOP) of 6,582 kPa by design and the current Certified Operation Pressure (COP) is 4,757 kPa.

Table K-33: Existing CEL LTL 168 Segments

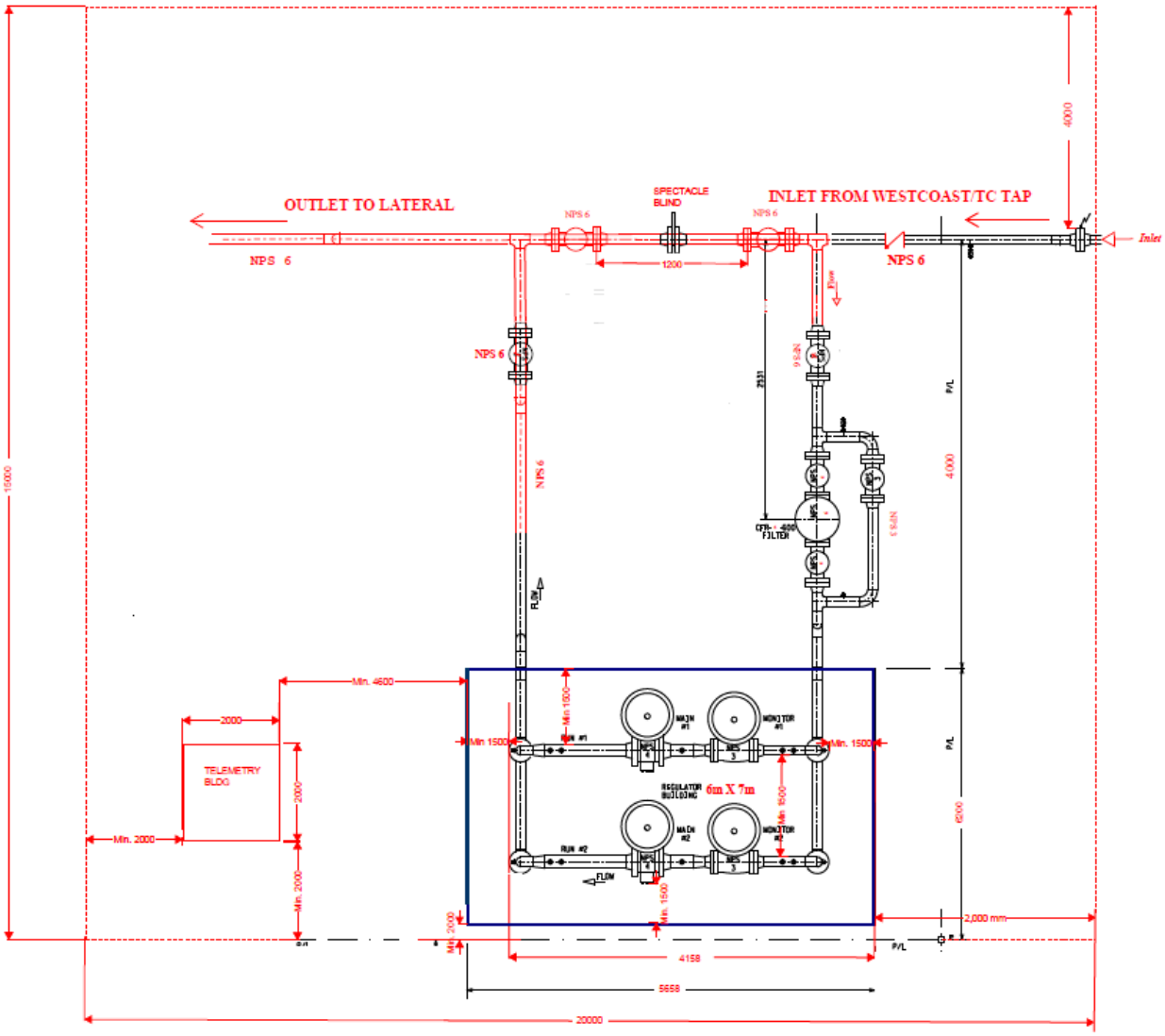
From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+009	NPS 6 Valve Station	2012
0+009	5+783	NPS 6	1960

1.2.11.2 *Proposed Pressure Regulating Station (PRS)*

For CEL LTL 168, the pressure will be regulated to 4,110 kPa, which FortisBC System Capacity Planning has determined that CEL LTL 168 will continue to meet firm customer demand beyond 2038 at this reduced pressure.

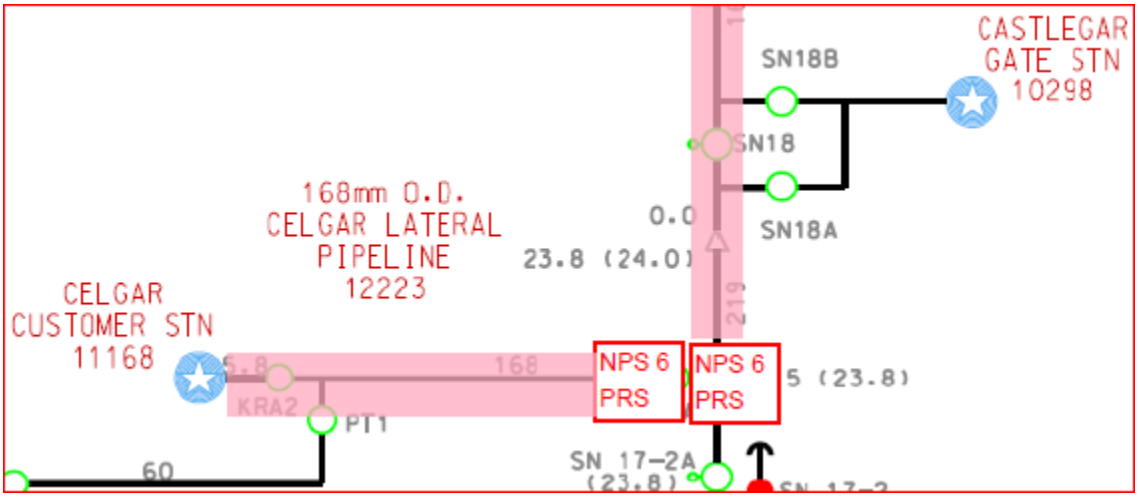
Refer to Figure K-26 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-26: Proposed CEL LTL 168/CAS NEL 168 PRS Site Layout



1.2.11.3 *System Flow Schematic*

Figure K-27: CEL LTL 168 Flow Schematic



1.2.11.4 *Land Requirements*

For CEL LTL 168 and CAS NEL 168, two PRS will be installed on the same site. The CEL LTL 168 PRS will be installed on the CEL LTL 168 take-off. The tentative new land requirement is 20.0m x 15.0m for each site but there is opportunity to condense the overall footprint by using one telemetry building instead of two, possibly one regulator building instead of two. These will be determined during detailed design.

1.2.11.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.11.6 *Deviation from Typical Pressure Regulating Station*

The proposed design for this location is to install two typical PRS assemblies – one for CEL LTL 168 and one for CAS NEL 168. The overall size will be determined during detailed design but efficiencies in total footprint size by combining the two sites are expected.

1.2.11.7 *System Configuration Notes*

The PRS will be installed downstream of the CEL LTL 168 lateral take-off to provide the desired pressure regulating on the CEL LTL 168 only.

1.2.12 Lateral 20 – Castlegar Nelson 168 (CAS NEL 168)

The Castlegar Nelson Lateral 168, identified as Lateral 20 for this Project, has PRS selected as the preferred alternative.

1.2.12.1 *Existing System*

The NPS 6 & 8 diameter, 37,530 metre long Castlegar Nelson Pipeline is supplied by Trail Castlegar Pipeline and supplies Castlegar and Nelson. The CAS NEL 168 has a Maximum Operating Pressure (MOP) of 4,989 kPa by design and the current Certified Operating Pressure (COP) is 4,757 kPa.

Table K-34: Existing CAS NEL 168 Segments

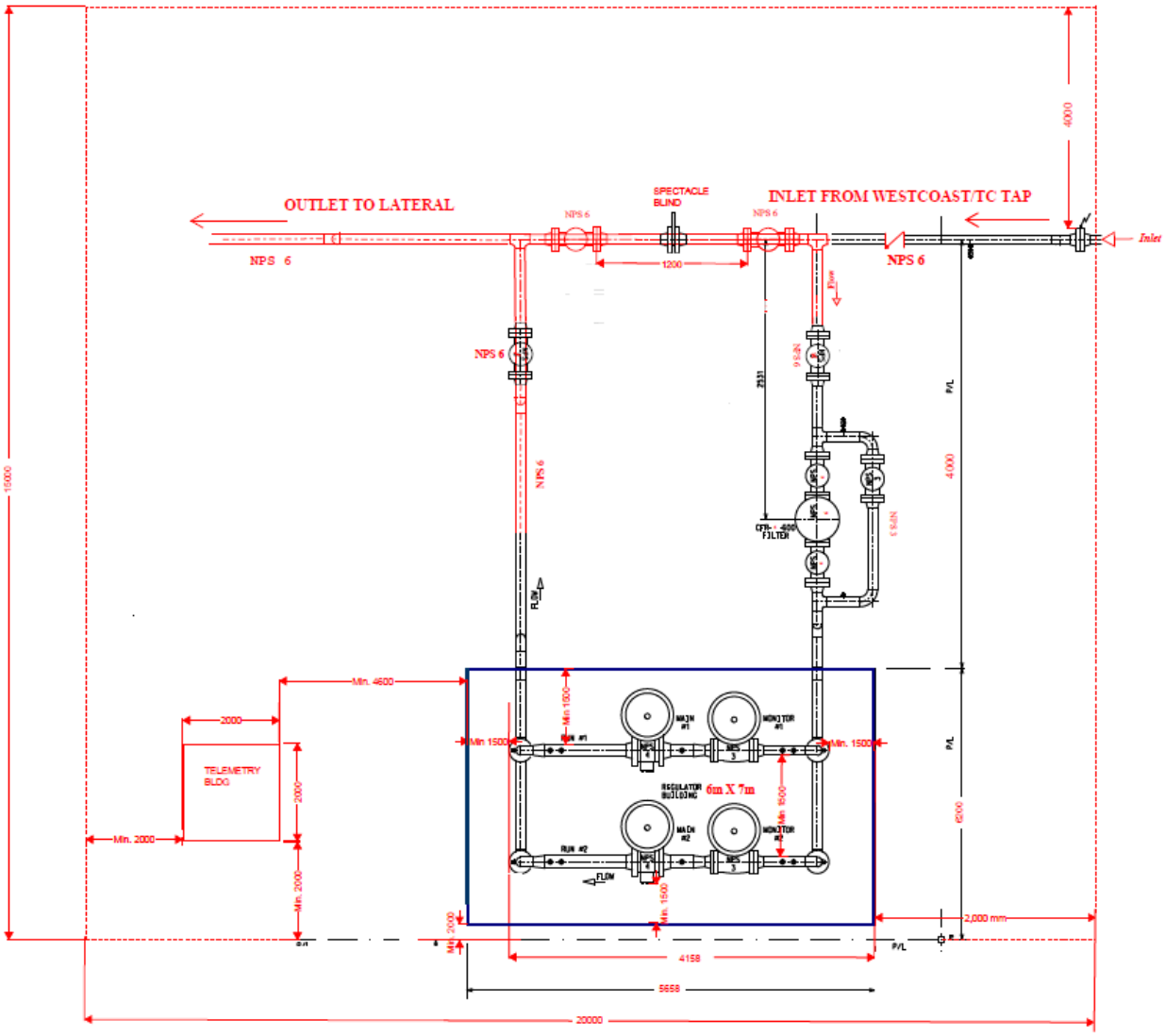
From KP	To KP	Diameter	Predominant Year of Construction
0+164	0-015	NPS 8	
0+015	0+006	NPS 6 Valve Station	2010
0+006	1+7723	NPS 6	1957
1+7723	17+257	NPS 6	1957
17+257	37+361	NPS 6	2012
37+361	37+366	NPS 6 Valve Station	2013

1.2.12.2 *Proposed Pressure Regulating Station (PRS)*

For CAS NEL 168, the pressure will be regulated to 4,946 kPa, which FortisBC System Capacity Planning has determined that CAS NEL 168 will continue to meet firm customer demand beyond 2038 at this reduced pressure.

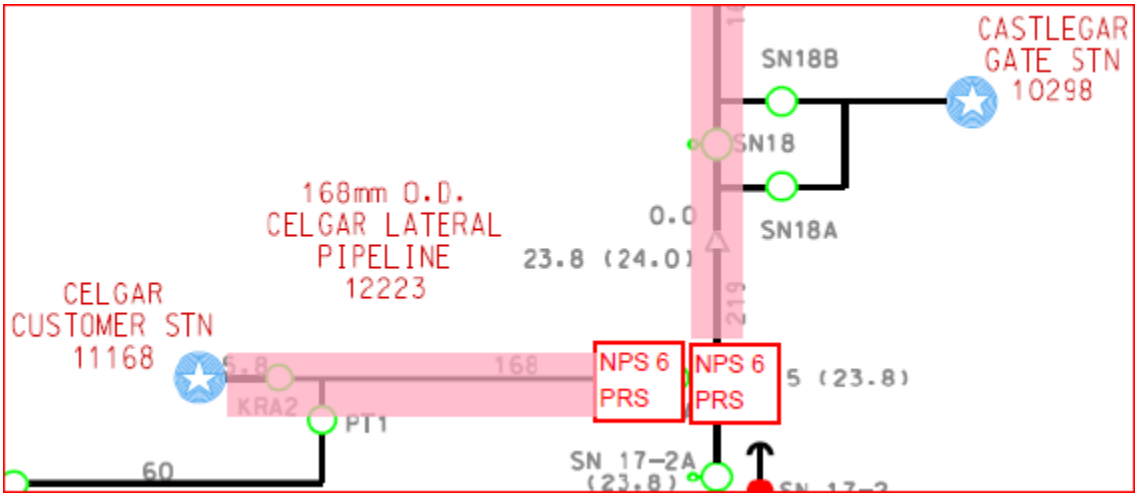
Refer to Figure K-28 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-28: Proposed CAS NEL 168/CEL LTL 168 PRS Site Layout



1.2.12.3 *System Flow Schematic*

Figure K-29: CAS NEL 168 Flow Schematic



1.2.12.4 *Land Requirements*

For CEL LTL 168 and CAS NEL 168, two PRS will be installed on the same site. The CAS NEL 168 PRS will be installed on just downstream of the CEL LTL 168 take-off. The tentative new land requirement is 20.0m x 15.0m for each site but there is opportunity to condense the overall footprint by using one telemetry building instead of two, possibly one regulator building instead of two. These will be determined during detailed design.

1.2.12.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.12.6 *Deviation from Typical PRS Upgrade*

The proposed design for this location is to install two typical PRS assemblies – one for CEL LTL 168 and one for CAS NEL 168. The overall size will be determined during detailed design but efficiencies in total footprint size by combining the two sites are expected.

Additionally, 175 metres of pipe will need to be replaced so that the set point of 4,946 kPa for the entire lateral will be below 30 percent SMYS.

1.2.12.7 *System Configuration Notes*

One PRS will provide pressure control for the CAS NEL 168 line. As mentioned previously, the location of the PRS will be downstream of the CEL LTL 168 since the pressure control set points will be different.

1.2.13 Lateral 21 – Trail Lateral 168 (TRA LTL 168)

The Trail Lateral 168, identified as Lateral 21 for this Project, has PRS selected as the preferred alternative.

1.2.13.1 *Existing System*

The NPS 6 diameter, 4,239 metre long Trail Lateral 168 branches off the NPS 10 diameter Penticton Trail Pipeline. At this take-off location, there is an existing facility called the SN-17 Valve Station. The Trail Lateral is tied-into the Warfield Compressor Station and supplies Warfield Gate Station and the Cominco Lateral 114. The TRL LTL 168 has a Maximum Operation Pressure (MOP) of 6,068 kPa by design and the current Certified Operation Pressure (COP) is 6,068 kPa.

Table K-35: Existing TRA LTL 168 Segments

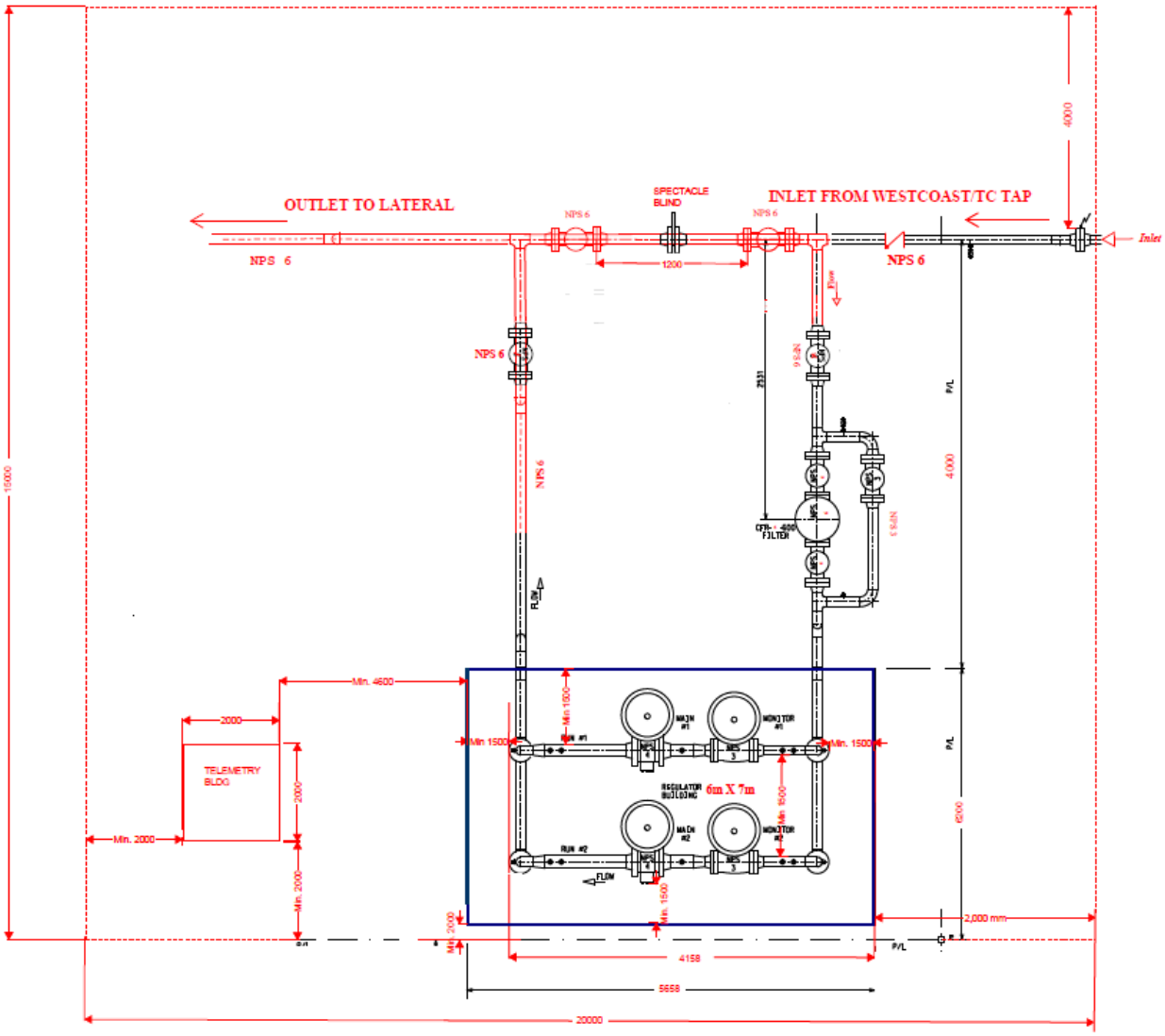
From KP	To KP	Diameter	Predominant Year of Construction
0+001	3+218	NPS 6	1957
3+218	3+400	NPS 6 (Water Crossing)	1992
3+400	4+239	NPS 6	1957

1.2.13.2 *Proposed Pressure Regulating Station (PRS)*

For TRL LTL 168, the pressure will be regulated to 4,110 kPa, which FortisBC System Capacity Planning has determined that TRL LTL 168 will continue to meet firm customer demand beyond 2038 at this reduced pressure.

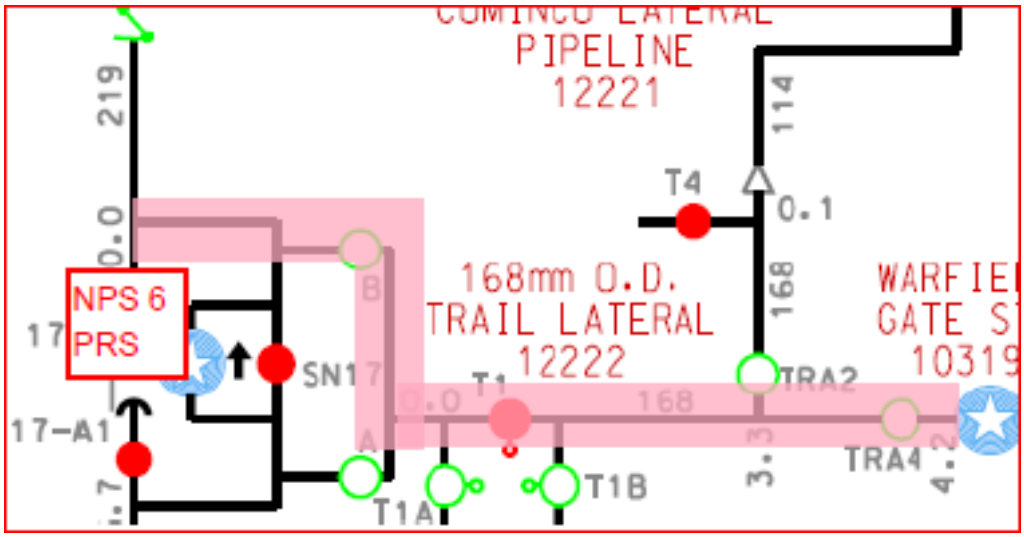
Refer to Figure K-30 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-30: Proposed TRA LTL 168 PRS Site Layout



1.2.13.3 *System Flow Schematic*

Figure K-31: TRA LTL 168 Flow Schematic



1.2.13.4 *Land Requirements*

For TRL LTL 168, the new NPS 6 PRS will be installed by expanding the existing facility site. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.13.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.13.6 *Deviation from Typical Pressure Regulating Station*

The proposed design for this location will integrate with existing pig barrels on site.

1.2.13.7 *System Configuration Notes*

A NPS 6 PRS will be installed upstream of the TRL LTL 168 lateral to provide the desired pressure regulating on the system.

1.2.14 Lateral 23 – Elkview Lateral 168 (ELK LTL 168)

The Elkview Lateral 168, identified as Lateral 23 for this Project, has PRS selected as the preferred alternative.

1.2.14.1 *Existing System*

The NPS 6 diameter, 1,565 metre long Elkview Lateral 168 branches off the NPS 8 diameter Fording Lateral. ELK LTL 168 is next to an active coal mine plant and supplied to Elkview Station, which is located within the coal mine plant. The ELK LTL 168 has a Maximum Operation Pressure (MOP) of 7,053 kPa by design and the current Certified Operation Pressure (COP) is 6,281 kPa.

Table K-36: Existing ELK LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	1+565	NPS 6	1970

1.2.14.2 *Proposed Pressure Regulating Station (PRS)*

For ELK LTL 168, the pressure will be regulated to 4,946 kPa, which FortisBC System Capacity Planning has determined that ELK LTL 168 will continue to meet firm customer demand beyond 2038 at this reduced pressure.

Refer to Figure K-32 for the proposed typical PRS layout. The new PRS will be tied-in while the laterals are still in operation by utilizing stopple hot taps and by-pass piping.

Figure K-32: Proposed ELK LTL 168 PRS Site Layout

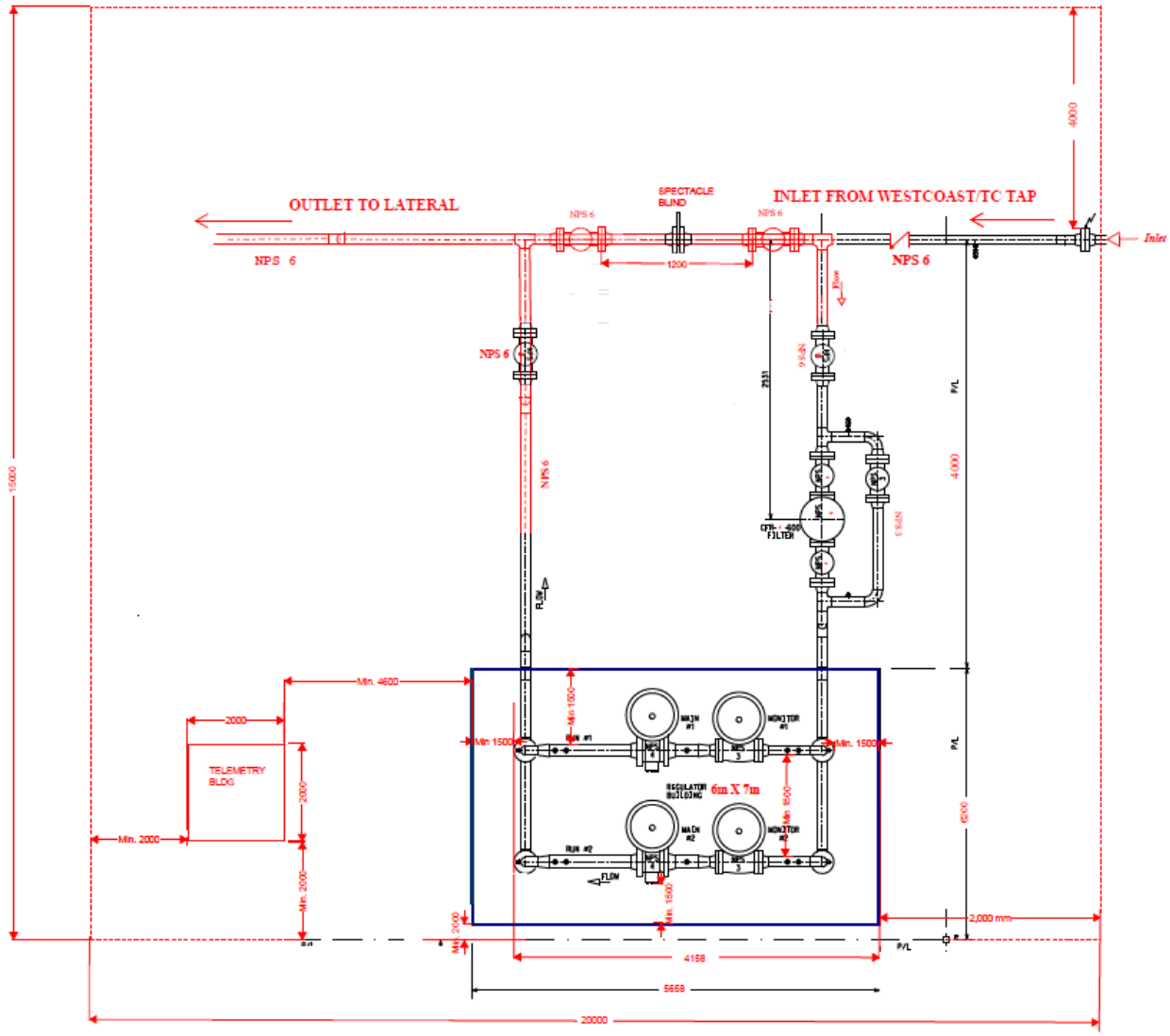


Table K-37: ELK LTL 168 Upgrade Requirements

Appurtenance Type	Mainline Size	# of Instances	Notes
CVA	NPS 6	1	Typical design
Launchers Assemblies	NPS 6	1	Typical design
MLVA	NPS 6	0	Typical design
Elbow/Bend Replacements	NPS 6	5	Excludes new tie-in bends
Tee/Branch Replacements	NPS 6	0	
Receivers Assemblies	NPS 6	1	Typical design
Stopple Upgrades	NPS 6	0	
Pipe Segments	NPS 6	0	None

1.2.14.3 *System Flow Schematic*

Figure K-33: ELK LTL 168 Flow Schematic

1.2.14.4 *Land Requirements*

For ELK LTL 168, the new NPS 6 PRS will be installed by expanding the existing valve site. The tentative new land requirement for the PRS installation is 20.0 x 15.0 metres but will be determined during detailed design.

1.2.14.5 *Environmental, Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.2.14.6 *Deviation from Typical Pressure Regulating Station*

The footprint of the PRS site will have to be customized due to the limited amount of space near the Elkview take-off.

1.2.14.7 *System Configuration Notes*

The proposed PRS will be installed downstream of the Elkview take-off so that the pressure control does not affect the rest of the Fording Lateral.

1.3 *DESCRIPTION OF TRANSMISSION LATERALS WITH PLR AS PREFERRED ALTERNATIVE*

There are a total of 4 lateral systems where pipeline replacement the preferred alternative. Below is a detailed Project description for each lateral system with the required upgrades discussed in Section 5.2.3.

1.3.1 Lateral 3 – BCF Lateral 168 (BCF LTL 168)

The BC Forest Products Lateral 168, identified as Lateral for this Project, has Pipeline Replacement (PLR) installation selected as the preferred alternative.

1.3.1.1 *Existing System*

The existing NPS 6 diameter, 455 metre lateral branches off MAC LTL 168 at KP 25+989, about 6 kilometres SW from the town of Mackenzie, BC, crosses under the CN Railway (two sets of tracks, previously owned by BC Rail) immediately downstream and terminates at Mackenzie Pulp Mill (formerly BC Forests Products). Along the lateral, there is a BCFP 1 plug valve at KP 0+056.

Table K-38: Existing BCF LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+063	NPS 6, rail crossing	1966
0+063	0+455	NPS 6	1970

1.3.1.2 *Pipeline Replacement*

The new proposed pipeline will be designed with a maximum hoop stress calculated using the Certified Operating Pressure at 29.9 percent of the pipe specified minimum yield strength.

1.3.1.3 *Design Parameters*

A schematic and alignment sheets of the proposed routing are available in Appendix J-1 (Stantec FEED, Appendix E.1).

Table K-39: New Pipeline Design Parameters

Diameter (mm)	168
Length (m)	455
Wall Thickness (mm)	7.1
Grade (MPa)	359
Certified Operating Pressure (kPa)	6453
% SMYS	29.9%

1.3.1.4 *Routing Considerations*

To minimize on the required footprint for the new pipeline installation, the new pipeline will be built directly parallel to the existing pipe centreline to the west and north, with approximately 3.0 metres offset between the centrelines for the open cut construction, and approximately 6.0 metres offset for the trenchless crossing.

The terrain is classified as gently rolling, with the elevation difference of 10 metres. Approximately 140 metres of the easement (up to 2,000 m^2) needs to be cleared of trees.

1.3.1.5 *Major Crossings*

There is one major crossing on this lateral – CN Rail. Pending confirmation from a geotechnical investigation, it will be installed using bore method. The estimated bore length is 80 metres.

1.3.1.6 *Valve Installations*

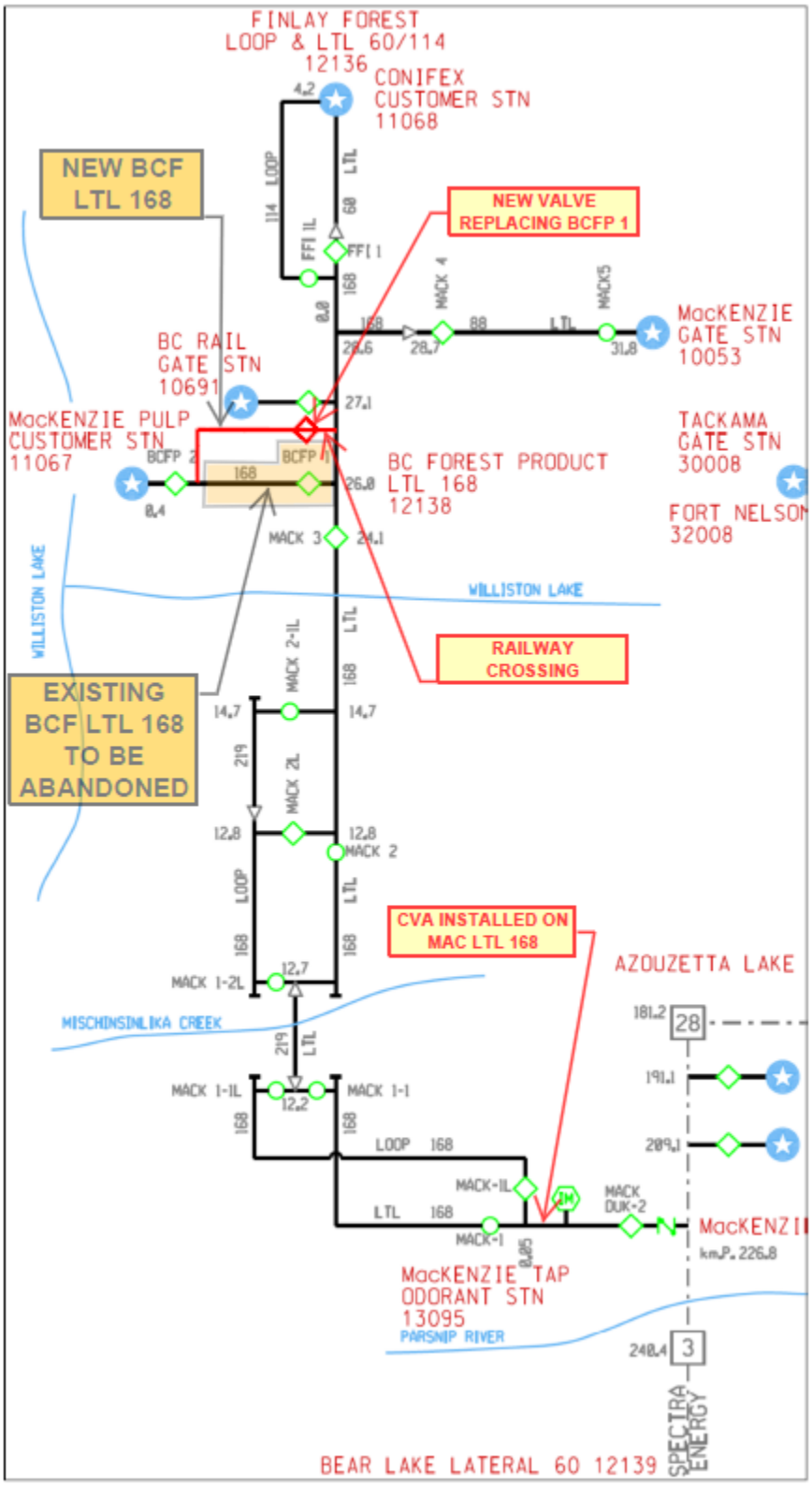
The existing BCFP 1 plug valve will be abandoned in place. The new proposed pipeline will utilize the typical above ground Mainline Valve Assembly (MLVA) installed immediately downstream of the railway crossing, at approximately KP 0+060. The alternative location of the MLBV is near the 6 X 6 tee of Mackenzie Lateral 168 and BCF Lateral 168. If Mackenzie Lateral 168 was scheduled to construct the modifications before the BCF lateral, the 6 X 6 tee modification work can be designed to have future provision for new BCF pipeline connection.

1.3.1.7 *Tie-in Procedure*

To safely tie-in the new lateral to the existing system, while in full operation, the stopple and bypass isolating, and tie-in procedure will be employed.

1.3.1.8 *System Flow Schematic*

Figure K-34: BCF LTL 168 System Flow Schematic



1.3.1.9 *Land Requirements*

There is no ROW for the existing lateral. The new ROW will be 18.0 metres wide and it will include the new lateral as well as the abandoned replaced lateral. In addition, 5.0 metres width of Temporary Work Space (TWS) will be required for construction.

The following figure illustrates the typical right-of-way cross section, with an existing 10 metre wide ROW.

Figure K-35: Typical ROW and TWS Cross Section with Existing 10.0 metre ROW

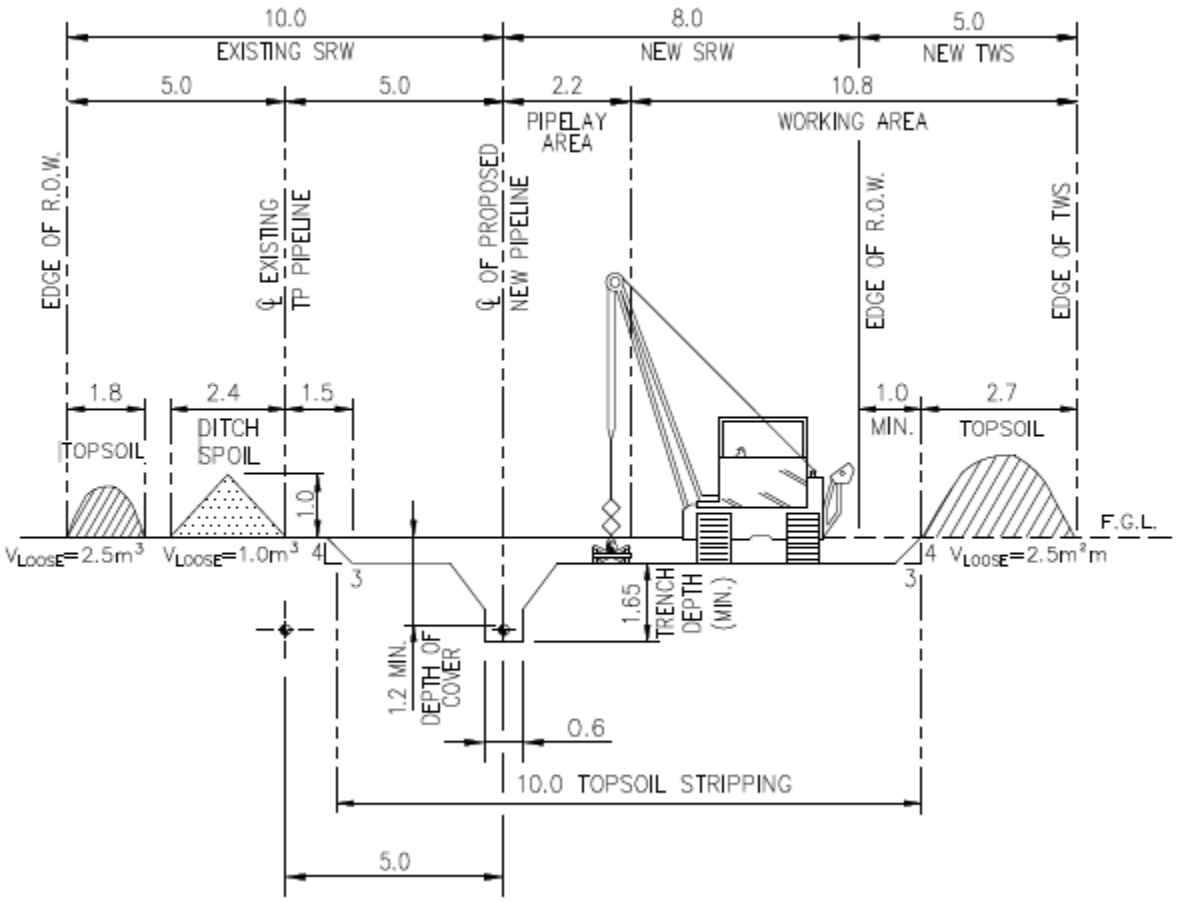


Table K-40: Summary of Land Requirements for BCF LTL 168

Diameter	Simple Crossings	Bored Crossings	HDD	Length (m)	ROW (m^2)	TWS (m^2)
6	0	1	0	455	8,190	4,375

1.3.1.10 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.3.2 Lateral 11 – Cariboo Pulp Lateral 168 (CAR LTL 168)

The Cariboo Pulp Lateral 168, identified as Lateral 11 for this project, has a Pipeline Replacement (PLR) selected as the Preferred Alternative.

1.3.2.1 *Existing System*

The NPS 6 diameter, 1,330 metres long Cariboo Pulp Lateral (CAR LTL 168) originates at Enbridge Westcoast Pipeline tap at KP 479.8, just south of Quesnel River Crossing and supplies the Cariboo Pulp Mill. The CAR LTL 168 has a Maximum Operation Pressure of 7,695 kPa by design and the current Certified Operation Pressure is 6,619 kPa.

Table K-41: Existing CAR LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+890	NPS 6, Valve	1972
0+890	1+330	NPS 6	1972

1.3.2.2 *Pipeline Replacement*

The new proposed pipeline will be designed with a maximum hoop stress calculated using the Certified Operating Pressure at 29.9 percent of the pipe specified minimum yield strength.

1.3.2.3 *Design Parameters*

Table K-42: New Pipeline Design Parameters

Diameter (mm)	168
Length (km)	0.455
Wall Thickness (mm)	7.1
Grade (MPa)	359
Certified Operating Pressure (kPa)	6453
% SMYS	29.9%

1.3.2.4 *Routing Considerations*

To minimize on the required footprint for the new pipeline installation, the new pipeline will be built directly parallel to the existing centreline to the west and north, with approximately 3.0

metres offset between the centrelines for the open cut construction, and approximately 6.0 metres offset for the trenchless crossing.

The terrain is classified as gently rolling, with the elevation difference of 10 metres.

1.3.2.5 *Major Crossings*

There are four crossings on this lateral. There are pulp mill hauling traffic through these roads. Open cut may impact the pulp mill operations and pose limitations in trucking flow. Sward Ave road crossings and Star Road crossing will be budgeted as HD bore and the minor road crossing seems to be a service road, will be open cut. The estimated bore length is 120 metres.

1.3.2.6 *Valve Installations*

There are no requirements for MLVAs on this lateral.

1.3.2.7 *Tie-In Procedure*

To safely tie-in the new lateral to the existing system, while in full operation, the stopple and bypass isolating, and tie-in procedure will be employed.

1.3.2.8 *Land Requirements*

There is no ROW for the existing lateral. The new ROW will be 18.0 metres wide and it will include the new lateral as well as the abandoned replaced lateral. In addition, 5.0 metres width of Temporary Work Space (TWS) will be required for construction.

The following figure illustrates the typical right-of-way cross section, with an existing 10 metre wide ROW.

Figure K-36: Typical ROW and TWS Cross Section with Existing 10.0 metre ROW

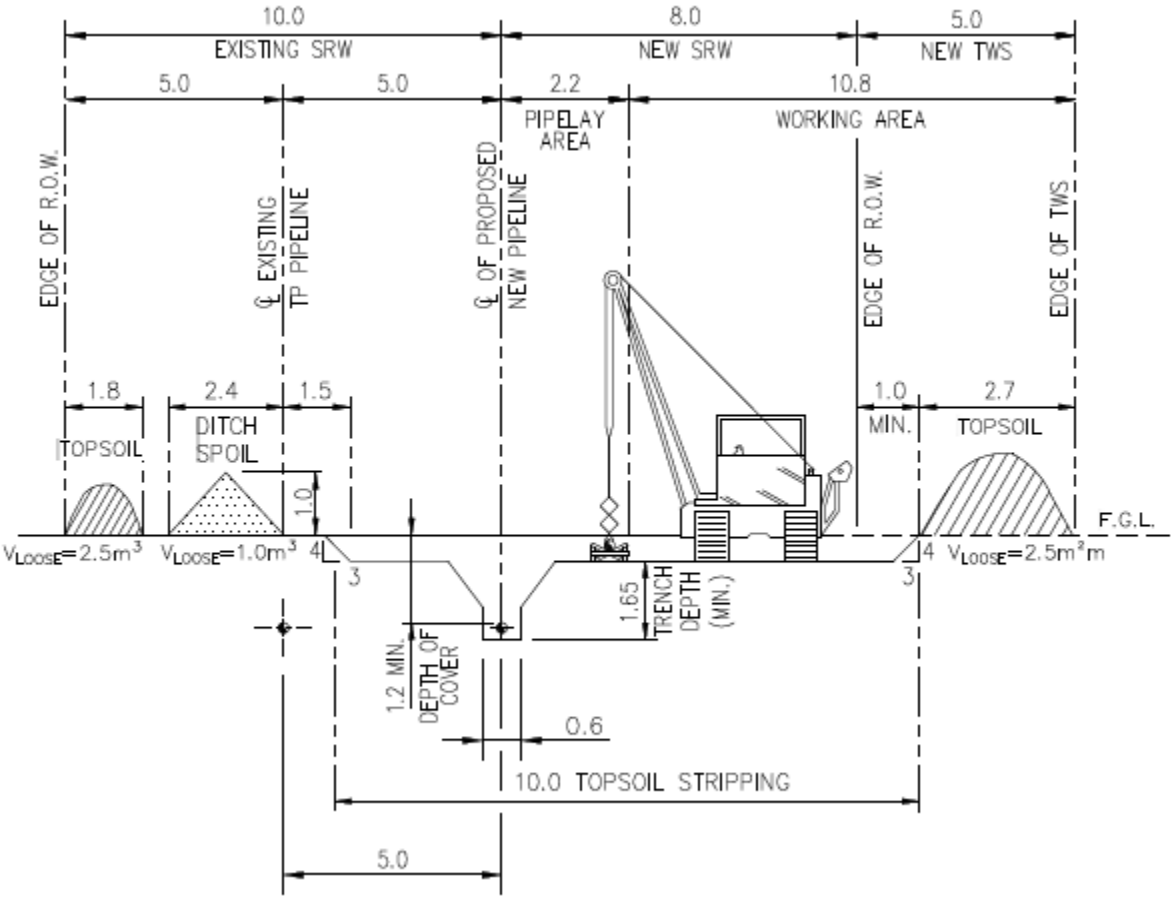
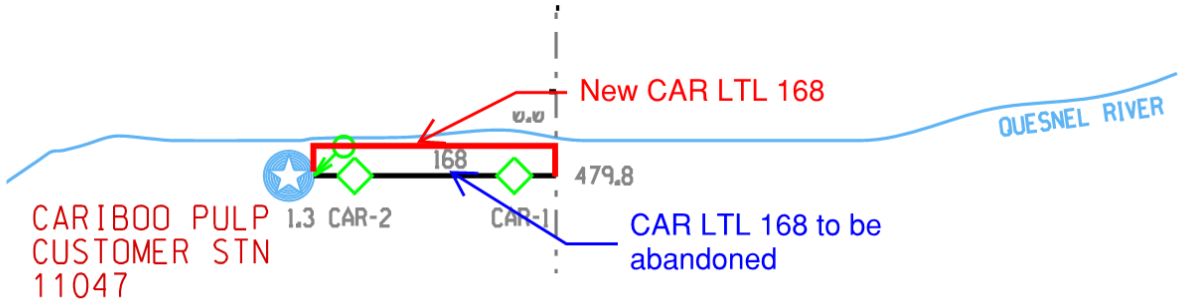


Table K-43: Summary of Land Requirements for BCF LTL 168

Diameter	Simple Crossings	Bored Crossings	HDD	Length (m)	ROW (m^2)	TWS (m^2)
6	0	1	0	455	8,190	4,375

1.3.2.9 *System Flow Schematic*

Figure K-37: CAR LTL 168 System Flow Schematic



1.3.2.10 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.3.3 Lateral 13 – Kamloops Lateral 273 (KA LTL 273)

The Kamloops Lateral 273, identified as Lateral 13 for this Project, has a Pipeline Replacement (PLR) installation selected as the preferred alternative.

1.3.3.1 *Existing System*

The existing NPS 6 & 8 diameter, 3570 metre Kamloops Lateral, branching off Savona Nelson 323 Mainline at approximately KP 35+600, near Dufferin residential development, City of Kamloops, BC, was looped by NPS 6 diameter Kamloops Loop for approximately 3,050 metres, and from that point Kamloops Loop merges with the Kamloops Lateral (becomes NPS 8 diameter) and continues to Kamloops Gate Station 10063.

Table K-44: Existing KA1 LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+001	NPS 6 Valve Station	2012
0+001	3+044	NPS 6	1965
3+044	3+058	NPS 8 MLVA	2009
3+058	3+570	NPS 8	1971

Table K-45: Existing KA1 LOP 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+008	NPS 6 Valve Station	2012
0+008	3+045	NPS 6	1979
3+045	3+050	NPS 6 MLVA	2009

1.3.3.2 *Pipeline Replacement*

The new proposed lateral, designated as KA LTL 273 will replace both existing lines, Kamloops Lateral 168 (KA1 LTL 168) and Kamloops Loop 168 (KA1 LOP 168). The new pipeline will be designed for the maximum hoop stress level from the Certified Operating Pressure (COP) of 6619 KPa at 29.9 percent of the pipe specified minimum yield strength.

1.3.3.3 *Design Parameters*

A schematic and alignment sheets of the proposed routing are available in Appendix J-1 (Stantec FEED, Appendix E.2).

Table K-46: New Pipeline Design Parameters

Diameter (mm)	273
Length (m)	3,570
Wall Thickness (mm)	9.3
Grade (MPa)	359
Certified Operating Pressure (kPa)	6619
% SMYS	29.9%

1.3.3.4 *Routing Considerations*

Minimizing the required footprint of the new pipeline installation, the pipeline will be built directly parallel to the existing pipeline ROW to the west, with approximately 5.0 metres offset between the new and the closer to existing pipeline centrelines.

This lateral routes through Mount Dufferin recreational area. The terrain is classified as hilly, with several steep slope sections. There is an overall elevation difference of 410 metres. The vegetation coverage is sparse, mainly consisting of shrubs.

1.3.3.5 *Major Crossings*

There are no major crossings on this lateral, but there is a possibility of crossing trails, drive ways, and drainage ditches.

1.3.3.6 *Valve Installations*

There are no requirements for MLVAs on this lateral.

1.3.3.7 *AC Mitigation*

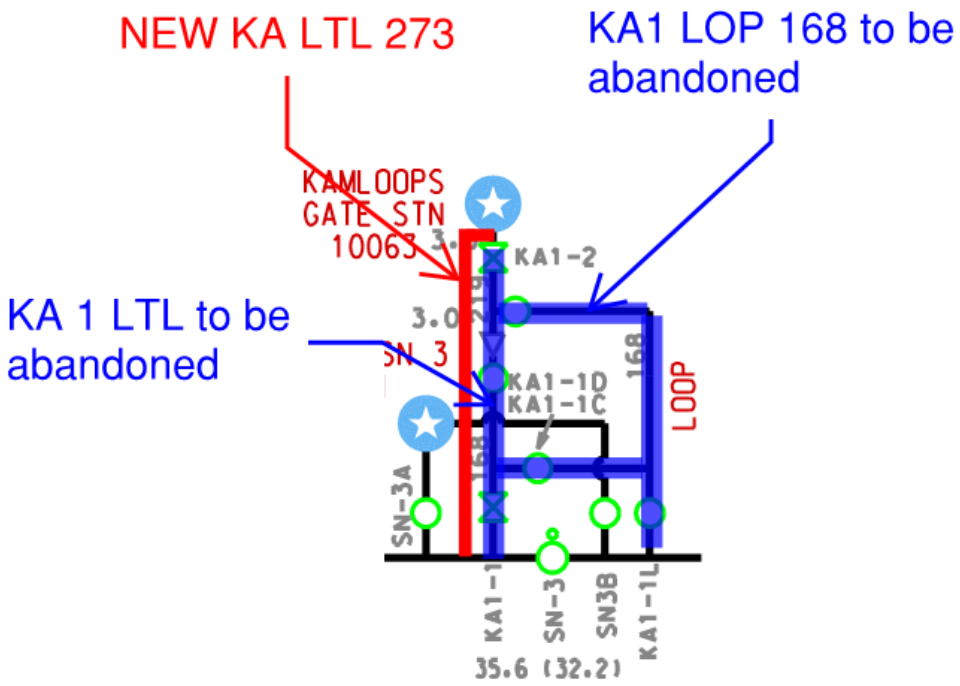
Sections of the new lateral routes along and in a close proximity to existing high voltage power lines. AC mitigation system will be implemented during construction.

1.3.3.8 *Tie-in Procedure*

To safely tie-in the new lateral to the existing system, while in full operation, the stopple and bypass isolating, and tie-in procedure will be employed.

1.3.3.9 *System Flow Schematic*

Figure K-38: KA1 LTL/LOP 168 System Flow Schematic



1.3.3.10 *Land Requirements*

For the section paralleling the two NPS 6 lines, the new 12.0 metres wide ROW will be directly adjacent to the existing 6.0 metre wide ROW, making the total ROW width of 18.0 metres. For

the section paralleling the one NPS 8 line, the new 6.0 metres wide ROW will be directly adjacent to the existing 12.0 metres wide ROW, making the total ROW width of 18.0 metres. In addition, 5.0 metres wide temporary work space (TWS) will be required for construction.

The pipeline routes through rural land. FortisBC Land group will provide the landowner information.

Table K-47: Summary of Land Requirements for KA LTL 273

Diameter	Simple Crossings	Bored Crossings	HDD	Length (m)	ROW (m^2)	TWS (m^2)
10	0	0	0	3570	39,720	17,850

1.3.3.11 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

1.3.4 Lateral 15 – Salmon Arm 3 Lateral 168 (SA3 LTL 168)

The Salmon Arm 3 Lateral 168, identified as Lateral 15 for this Project, has a Pipeline Replacement (PLR) installation selected as the preferred alternative.

1.3.4.1 *Existing System*

The existing NPS 6 diameter, 853 metre Salmon Arm 3 Lateral branches off SAL LTL 114 and SAL LOP 168 at approximately KP 38+300, about 7 kilometres SE from the City of Salmon Arm, BC, runs north along the western edge of Shuswap National Golf Course, and terminates at Auto Road Gate Station 10166.

Table K-48: Existing SA3 LTL 168 Segments

From KP	To KP	Diameter	Predominant Year of Construction
0+000	0+014	NPS 6 Valve Station	2013
0+014	0+853	NPS 6	1981

1.3.4.2 *Pipeline Replacement*

The new proposed pipeline will be designed for the maximum hoop stress level from the Certified Operating Pressure (COP) of 6619 KPa at 29.9 percent of the pipe specified minimum yield strength.

1.3.4.3 *Design Parameters*

A schematic and alignment sheets of the proposed routing are available in Appendix J-1 (Stantec FEED, Appendix E.3).

Table K-49: Replacement Details for SA3 LTL 168

Diameter (mm)	168
Length (m)	853
Wall Thickness (mm)	7.1
Grade (MPa)	359
Certified Operating Pressure (kPa)	6619
% SMYS	29.9

1.3.4.4 *Routing Considerations*

To minimize on the required footprint for the new pipeline installation, the new pipeline will be built directly parallel to the existing centreline to the east, with approximately 3.0 metres offset between the centrelines.

The terrain is classified as gently rolling, with the elevation difference of 16 metres. Almost the entire length of this lateral runs parallel to Shuswap National Golf Course, specifically Hole 1 and Hole 2. Approximately 360 metres (up to 2,800 m^2) of the new ROW needs to be cleared of trees.

1.3.4.5 *Major Crossings*

There are no major crossings on this lateral.

1.3.4.6 *Valve Installations*

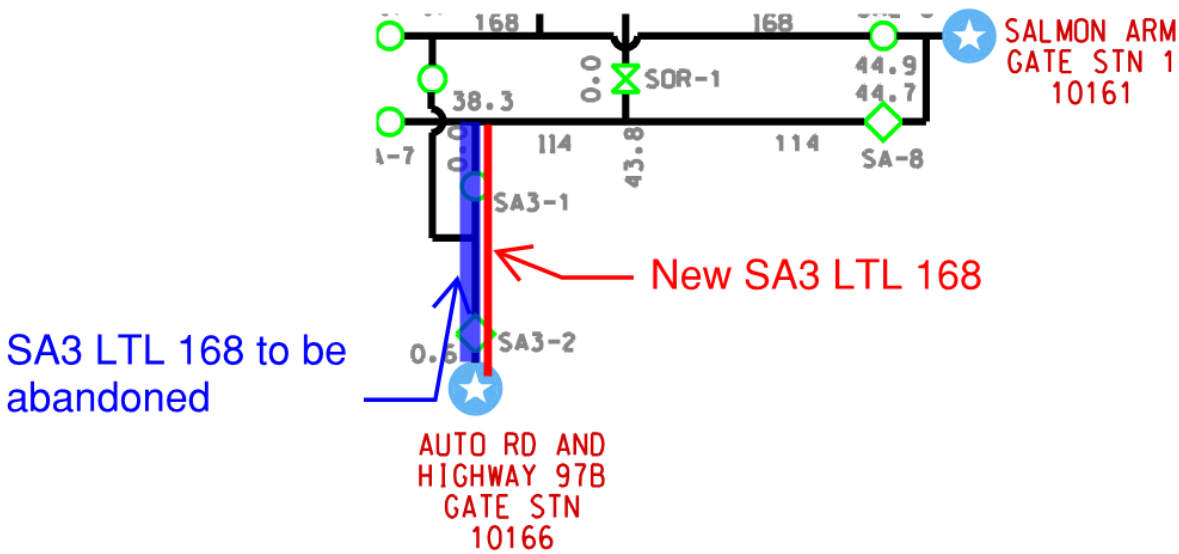
There are no requirements for MLVAs on this lateral.

1.3.4.7 *Tie-in Procedure*

To safely tie-in the new lateral to the existing system, while in full operation, the stopple and bypass isolating, and tie-in procedure will be employed.

1.3.4.8 *System Flow Schematic*

Figure K-39: SA3 LTL 168 System Flow Schematic



1.3.4.9 *Land Requirements*

The new 9.0 metre wide Right of Way (ROW) will be directly adjacent to the existing 9.0 metre wide ROW, making the total ROW width of 18.0 metres. In addition, 5.0 metres wide temporary work space (TWS) will be required for construction. There is no additional land requirement for simple crossings.

The pipeline routes through rural land, along the western edge of Shuswap National Golf Course. FortisBC Land group will provide the landowner information.

Table K-50: Summary of Land Requirements for SA3 LTL 168

Diameter	Simple Crossings	Bored Crossings	HDD	Length (m)	ROW (m^2)	TWS (m^2)
6	2	0	0	853	7,677	4265

1.3.4.10 *Environmental and Archaeological Considerations*

FEI will undertake environmental and archaeological assessments of all upgrade sites and will implement all recommended mitigation of potential environmental and archaeological impacts as recommended by such assessments.

Appendix L

RISK ANALYSIS

FILED CONFIDENTIALLY

Appendix L-1

STANTEC RISK REGISTER

FILED CONFIDENTIALLY

Appendix L-2

BRAMCON REPORT

FILED CONFIDENTIALLY

Appendix L-3

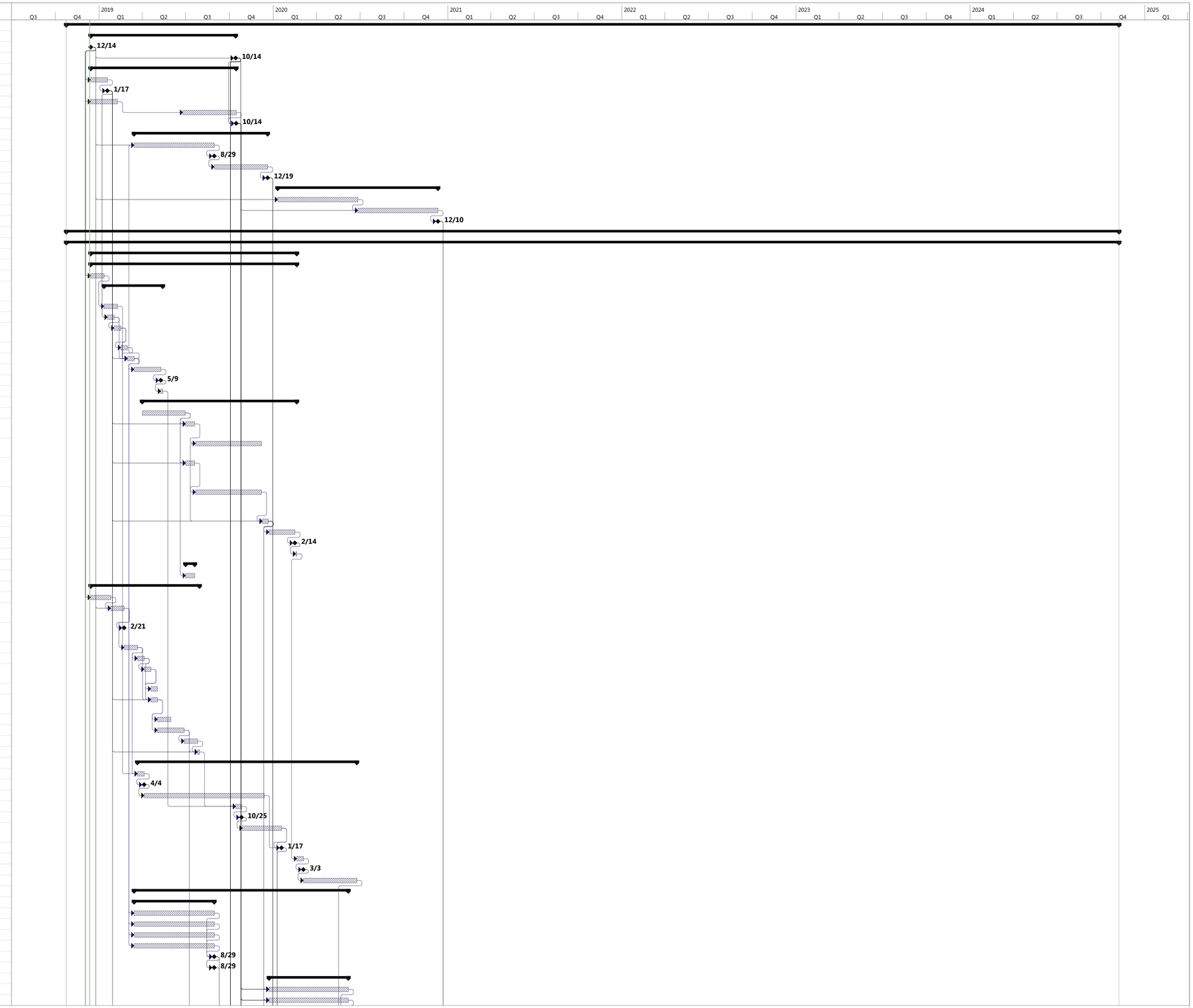
VALIDATION ESTIMATING LLC REPORT

FILED CONFIDENTIALLY

Appendix M

DETAILED SCHEDULE

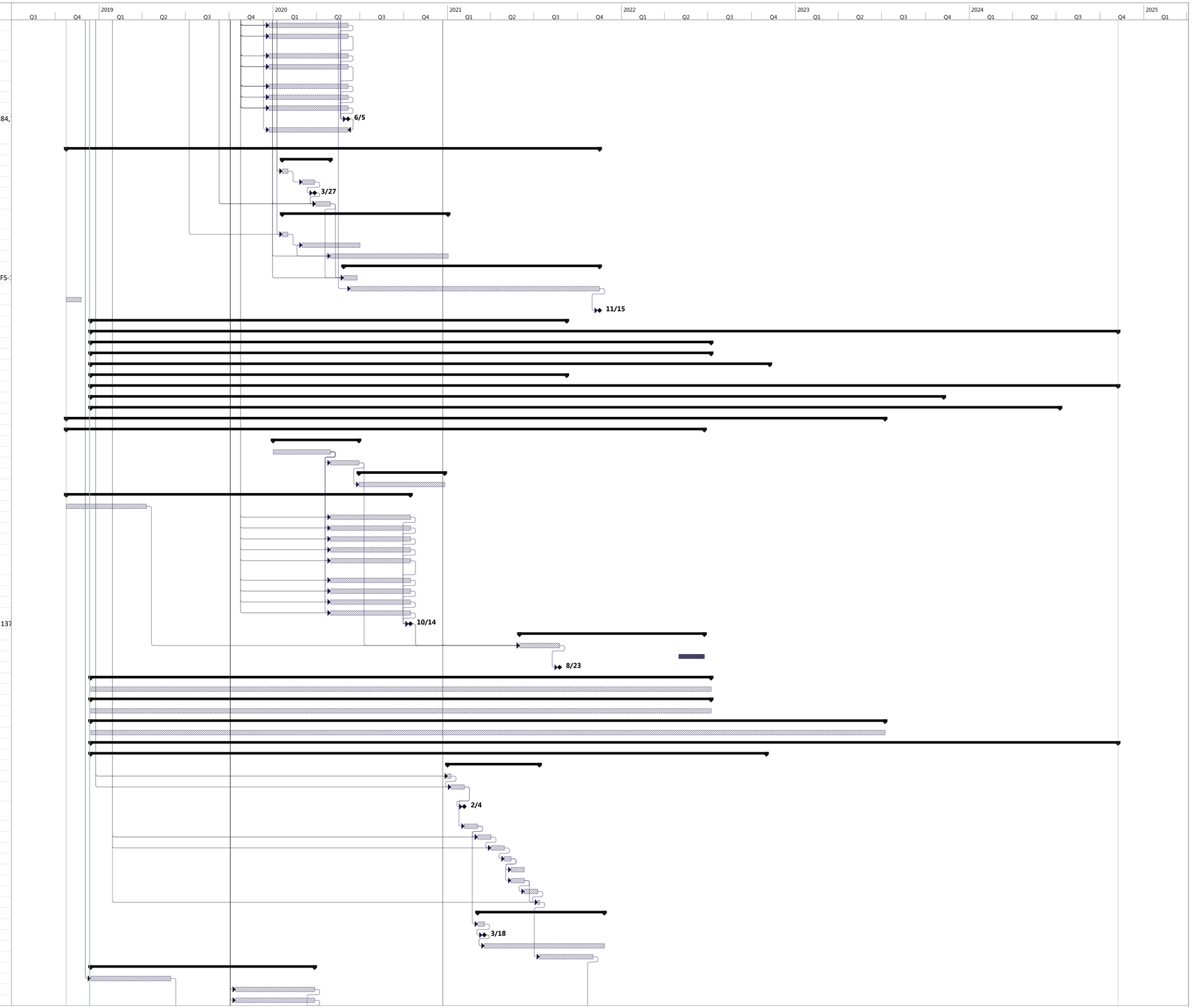
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Inland Gas Upgrades**	**1577 days**	**Wed 10/24/18**	**Thu 11/7/24**	
2		**CPCN Application**	**216 days**	**Fri 12/14/18**	**Mon 10/14/19**	
3		Submit CPCN Application	0 days	Fri 12/14/18	Fri 12/14/18	
4		Anticipated CPCN Approval	0 days	Mon 10/14/19	Mon 10/14/19	3
5		**Procurement - Engineering Services**	**217 days**	**Fri 12/14/18**	**Mon 10/14/19**	
6		Determine Pre-Cosntruction Engineering Scope	5 wks	Fri 12/14/18	Thu 1/17/19	3
7		Engage Pre-Construction Engineering	0 wks	Thu 1/17/19	Thu 1/17/19	6
8		Determine Detailed Engineering Scope	2 mons	Fri 12/14/18	Thu 2/7/19	3
9		Procure Detailed Engineering Services	4 mons	Tue 6/25/19	Mon 10/14/19	8
10		Engage Detailed Engineering Services	0 days	Mon 10/14/19	Mon 10/14/19	9,4
11		**Procurement - Contractor(s) ILI**	**200 days**	**Fri 3/15/19**	**Thu 12/19/19**	
12		Develop Tender Package	6 mons	Fri 3/15/19	Thu 8/29/19	3,30
13		Issue RFP	0 days	Thu 8/29/19	Thu 8/29/19	12
14		Contractor tendering and negotiation	4 mons	Fri 8/30/19	Thu 12/19/19	13
15		Contract Award - Prime Contractor ILI	0 days	Thu 12/19/19	Thu 12/19/19	14
16		**Procurement - Contractor PLR & PRS**	**240 days**	**Fri 1/10/20**	**Thu 12/10/20**	
17		Develop construction procurement docs	6 mons	Fri 1/10/20	Thu 6/25/20	3FS+14 mons
18		Contractor tendering and negotiation	6 mons	Fri 6/26/20	Thu 12/10/20	17,4
19		Contract Award - Prime Contractor PLR & PRS	0 days	Thu 12/10/20	Thu 12/10/20	18
20		**ILI Laterals**	**1577 days**	**Wed 10/24/18**	**Thu 11/7/24**	
21		**Mackenzie Lateral 168 ILI**	**1577 days**	**Wed 10/24/18**	**Thu 11/7/24**	
22		**Engineering**	**308 days**	**Fri 12/14/18**	**Tue 2/18/20**	
23		**Pipeline Detailed Design**	**308 days**	**Fri 12/14/18**	**Tue 2/18/20**	
24		Issue DBM for Detailed Design	1 mon	Fri 12/14/18	Thu 1/10/19	3
25		**Launcher/Receiver Assembly, Main Line Valve Assembly**	**87 days**	**Fri 1/11/19**	**Mon 5/13/19**	
26		BOM Long Lead (valves)	1 mon	Fri 1/11/19	Thu 2/7/19	24
27		Piping Detail	2 wks	Fri 1/18/19	Thu 1/31/19	7
28		Site Plan with Stopple and Bypass Configuration	2 wks	Fri 2/1/19	Thu 2/14/19	27
29		Weld ID Sheet	2 wks	Fri 2/15/19	Thu 2/28/19	28
30		IFR Launcher/Receiver	2 wks	Fri 3/1/19	Thu 3/14/19	28,7,27,29
31		Drawing Review	2 mons	Fri 3/15/19	Thu 5/9/19	30
32		IFC Launcher/Receiver	0 mons	Thu 5/9/19	Thu 5/9/19	31
33		BOM Assemblies (Valves, LRA and piping)	2 days	Fri 5/10/19	Mon 5/13/19	32
34		**ILI Modifications (Bends, Tees)**	**232 days**	**Mon 4/1/19**	**Tue 2/18/20**	
35		Preconstruction Survey (Bend information)	3 emons	Mon 4/1/19	Sun 6/30/19	
36		Site Plan with Access Information (Template)	3 wks	Mon 7/1/19	Fri 7/19/19	7,35
37		Site Plan with Access Information (All Bends and Tees) 1 week each	20 wks	Mon 7/22/19	Fri 12/6/19	36
38		Site Plan with Stopple and Bypass Configuration, and details of bend (Template)	3 wks	Mon 7/1/19	Fri 7/19/19	7,35
39		Site Plan with Stopple and Bypass Configuration, and details of bend (All Bends and Tees) 1 week each	20 wks	Mon 7/22/19	Fri 12/6/19	38
40		IFR Modifications	2 wks	Mon 12/9/19	Fri 12/20/19	7,37SS+5 wks,39
41		Drawing Review	2 mons	Mon 12/23/19	Fri 2/14/20	40
42		IFC Modifications	0 mons	Fri 2/14/20	Fri 2/14/20	41
43		BOM Modifications	2 days	Mon 2/17/20	Tue 2/18/20	42
44		**Stopple Upgrade**	**15 days**	**Mon 7/1/19**	**Fri 7/19/19**	
45		Site Plan with Access Information	3 wks	Mon 7/1/19	Fri 7/19/19	35
46		**Facilities Detailed Design**	**162 days**	**Fri 12/14/18**	**Mon 7/29/19**	
47		System Planning Information	6 wks	Fri 12/14/18	Thu 1/24/19	3
48		Issue DBM for Detailed Design (facilities/process)	1 mon	Fri 1/25/19	Thu 2/21/19	3,47
49		Engage Electrical and Instrumentation, Civil Engineering	0 days	Thu 2/21/19	Thu 2/21/19	48
50		BOM Long Lead (Valves, Control Valves)	1 mon	Fri 2/22/19	Thu 3/21/19	48
51		Piping Detail	2 wks	Fri 3/22/19	Thu 4/4/19	50
52		Site plan with stopple and bypass configuration	2 wks	Fri 4/5/19	Thu 4/18/19	51
53		Weld ID Sheet	2 wks	Fri 4/19/19	Thu 5/2/19	52
54		IFR Assembly Piping (Valves, CVA piping, telemetry, foundations)	2 wks	Fri 4/19/19	Thu 5/2/19	7,50,51,52
55		IFR Telemetry, Civil	1 mon	Fri 5/3/19	Thu 5/30/19	54
56		IFC Assembly Piping (Valves, CVA piping)	2 mons	Fri 5/3/19	Thu 6/27/19	54
57		IFC Telemetry, Civil	1 mon	Fri 6/28/19	Thu 7/25/19	56
58		Final BOM CVA	2 days	Fri 7/26/19	Mon 7/29/19	7,57,56
59		**Procure Materials**	**328 days**	**Fri 3/22/19**	**Tue 6/23/20**	
60		PR Long Lead Items	2 wks	Fri 3/22/19	Thu 4/4/19	50,26
61		Issue Order of Long Lead Items	0 days	Thu 4/4/19	Thu 4/4/19	60
62		Procurement of Long Lead Items (Valves)	9 mons	Fri 4/5/19	Thu 12/12/19	61
63		PR Assembly Piping	2 wks	Mon 10/14/19	Fri 10/25/19	58,33,4
64		Issue Order of Assembly Piping	0 days	Fri 10/25/19	Fri 10/25/19	63
65		Procurement of Assembly Piping (CVA and LRA piping, foundations)	3 mons	Mon 10/28/19	Fri 1/17/20	64
66		Receipt of All Assembly Materials	0 days	Fri 1/17/20	Fri 1/17/20	62,65
67		PR Bends and Modifications	2 wks	Wed 2/19/20	Tue 3/3/20	43
68		Issue Order of Bends and Modifications	0 days	Tue 3/3/20	Tue 3/3/20	67
69		Procurement of Bends and Modifications	4 mons	Wed 3/4/20	Tue 6/23/20	68
70		**Permitting and Approval**	**321 days**	**Fri 3/15/19**	**Fri 6/5/20**	
71		**Permitting and Approval for Assemblies**	**120 days**	**Fri 3/15/19**	**Thu 8/29/19**	
72		Non Crown Land Acquisition for Assemblies	6 mons	Fri 3/15/19	Thu 8/29/19	30
73		Utility Permits	6 mons	Fri 3/15/19	Thu 8/29/19	30
74		ALC Permit	6 mons	Fri 3/15/19	Thu 8/29/19	30
75		Landowners Notification	6 mons	Fri 3/15/19	Thu 8/29/19	30
76		Assembly Permits Obtained	0 days	Thu 8/29/19	Thu 8/29/19	72,73,74,75
77		Crown Land Acquisition for Assemblies	0 days	Thu 8/29/19	Thu 8/29/19	76
78		**Permitting and Approval for Bends**	**120 days**	**Mon 12/23/19**	**Fri 6/5/20**	
79		BC OGC Permit	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
80		Indigenous Communities Consultation	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40



Project: Combined
Date: Wed 12/12/18

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

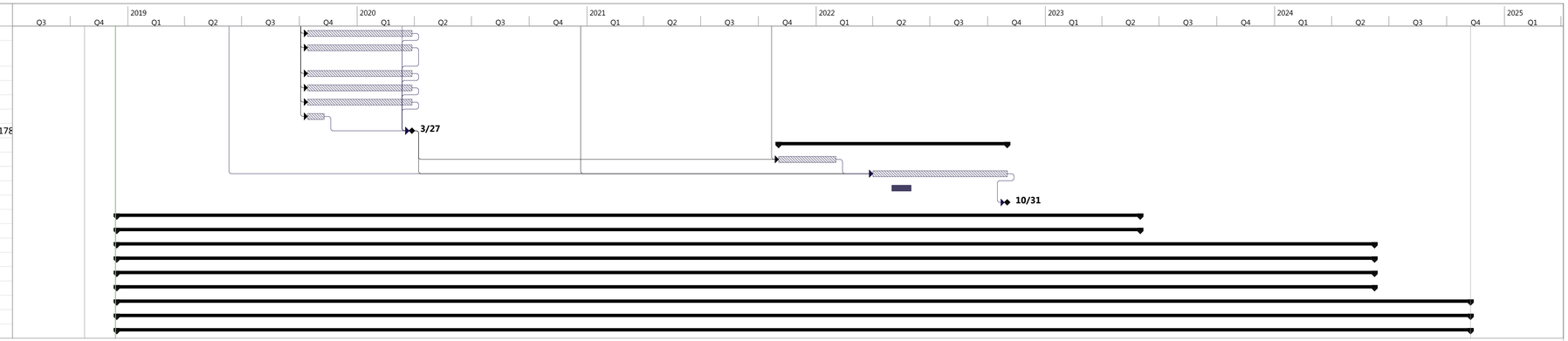
ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
81		ALC Permit	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
82		Federal Permits (Fisheries Act, Species at Risk Act)	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
83		Railway Crossing Permits	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
84		Ministry of Transportation and Infrastructure Permits	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
85		Municipal Permits	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
86		Environmental/Archaeological Permits	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
87		Landowners Notification	6 mons	Mon 12/23/19	Fri 6/5/20	4,10,40
88		Bend Permits Obtained	0 days	Fri 6/5/20	Fri 6/5/20	80,81,82,85,86,87,83,84,
89		Property Acquisition for Bends and Modifications	6 mons	Mon 12/23/19	Fri 6/5/20	88FF,40
90		**Construction**	**799 days**	**Wed 10/24/18**	**Mon 11/15/21**	
91		**Control Valve Assembly**	**73 days**	**Mon 1/20/20**	**Wed 4/29/20**	
92		Hydrostatic Testing	2 wks	Mon 1/20/20	Fri 1/31/20	66
93		Fabrication	1 mon	Mon 3/2/20	Fri 3/27/20	92
94		Construction Start	0 days	Fri 3/27/20	Fri 3/27/20	93
95		Construction	1.15 mons	Mon 3/30/20	Wed 4/29/20	76,15,77,94
96		**Launcher/Receiver Assembly, Main Line Valve Assembly**	**250 days**	**Mon 1/20/20**	**Fri 1/1/21**	
97		Hydrostatic Testing	2 wks	Mon 1/20/20	Fri 1/31/20	65,56
98		Fabrication	87 days	Mon 3/2/20	Tue 6/30/20	97
99		Construction	177 days	Thu 4/30/20	Fri 1/1/21	95,15,98SS+1 mon
100		**Bends and Modifications**	**383 days**	**Thu 5/28/20**	**Mon 11/15/21**	
101		Hydrostatic Testing	4 wks	Thu 5/28/20	Wed 6/24/20	95,99SS+1 mon,15,69FS-
102		Construction	18.65 mons	Thu 6/11/20	Mon 11/15/21	101SS+2 wks
103		Restoration/Clean up	1.15 mons	Wed 10/24/18	Fri 11/23/18	
104		In-Service Date	0 days	Mon 11/15/21	Mon 11/15/21	102
105		**Cranbrook Lateral 168 ILI**	**713 days**	**Fri 12/14/18**	**Tue 9/7/21**	
107		**Fording Lateral 219/168 ILI**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	
109		**Cranbrook Loop 219 ILI**	**930 days**	**Fri 12/14/18**	**Thu 7/7/22**	
111		**Cranbrook Kimberley Loop 219**	**930 days**	**Fri 12/14/18**	**Thu 7/7/22**	
113		**Mackenzie Loop 168 ILI**	**1017 days**	**Fri 12/14/18**	**Mon 11/7/22**	
115		**Cranbrook Kimberley Loop 273**	**713 days**	**Fri 12/14/18**	**Tue 9/7/21**	
117		**Salmon Arm Loop 168 ILI**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	
119		**Kimberley Lateral 168 ILI**	**1278 days**	**Fri 12/14/18**	**Tue 11/7/23**	
121		**Skookumchuck Lateral 219 ILI**	**1452 days**	**Fri 12/14/18**	**Mon 7/8/24**	
123		**PLR Laterals**	**1228 days**	**Wed 10/24/18**	**Fri 7/7/23**	
124		**Cariboo Pulp Lateral PLR**	**957 days**	**Wed 10/24/18**	**Thu 6/23/22**	
125		**Engineering**	**128 days**	**Wed 1/1/20**	**Mon 6/29/20**	
126		IFR PLR	4 emons	Wed 1/1/20	Thu 4/30/20	
127		IFC PLR	2 emons	Thu 4/30/20	Mon 6/29/20	126
128		**Procurement**	**130 days**	**Mon 6/29/20**	**Sat 12/26/20**	
129		Procurement of piping	6 emons	Mon 6/29/20	Sat 12/26/20	127
130		**Permitting and Approval**	**516 days**	**Wed 10/24/18**	**Wed 10/14/20**	
131		Land Acquisition	6 mons	Wed 10/24/18	Tue 4/9/19	
132		OGC	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
133		Indigenous Communities Consultation	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
134		Federal Permits (DFO, SARA)	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
135		Railway Crossing Permits	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
136		Ministry of Transportation and Infrastructure Permits	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
137		Municipal Permits	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
138		Utility Permits	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
139		Environmental/Archaeological	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
140		Landowners Notification	6 mons	Thu 4/30/20	Wed 10/14/20	126,4
141		Permits Obtained	0 days	Wed 10/14/20	Wed 10/14/20	132,133,134,135,136,137
142		**Construction**	**278 days**	**Tue 6/1/21**	**Thu 6/23/22**	
143		Construction	3 mons	Tue 6/1/21	Mon 8/23/21	127,131,141,19
144		Restoration/Clean up	2 mons	Sun 5/1/22	Thu 6/23/22	
145		In-Service Date	0 days	Mon 8/23/21	Mon 8/23/21	143
146		**BC Forest Products Lateral PLR**	**930 days**	**Fri 12/14/18**	**Thu 7/7/22**	
147		BC Forest Products Lateral PLR	930 days	Fri 12/14/18	Thu 7/7/22	
148		**Salmon Arm 3 Lateral PLR**	**930 days**	**Fri 12/14/18**	**Thu 7/7/22**	
149		Salmon Arm 3 Lateral PLR	930 days	Fri 12/14/18	Thu 7/7/22	
150		**Kamloops Lateral PLR**	**1191 days**	**Fri 12/14/18**	**Fri 7/7/23**	
151		Kamloops Lateral PLR	1191 days	Fri 12/14/18	Fri 7/7/23	
152		**PRS Laterals**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	
153		**Prince George 3, Northwood Pulp PRS**	**1012 days**	**Fri 12/14/18**	**Mon 10/31/22**	
154		**Engineering**	**137 days**	**Fri 1/1/21**	**Mon 7/12/21**	
155		System Planning Information	1 wk	Fri 1/1/21	Thu 1/7/21	3
156		Issue DBM for Detailed Design (facilities/process)	1 mon	Fri 1/8/21	Thu 2/4/21	155,3
157		Engage Electrical and Instrumentation, Civil Engineering	0 days	Thu 2/4/21	Thu 2/4/21	156
158		BOM Long Lead (Valves, Control Valves)	1 mon	Fri 2/5/21	Thu 3/4/21	156
159		P&ID	1 mon	Fri 3/5/21	Thu 4/1/21	7,158
160		Detailed Site Layout	1 mon	Fri 4/2/21	Thu 4/29/21	159,7
161		IFR Mechanical	2 wks	Fri 4/30/21	Thu 5/13/21	160
162		IFR Telemetry, Civil	1 mon	Fri 5/14/21	Thu 6/10/21	161
163		IFC Mechanical	1 mon	Fri 5/14/21	Thu 6/10/21	161
164		IFC Telemetry, Civil	1 mon	Fri 6/11/21	Thu 7/8/21	163
165		Final BOM PRS	2 days	Fri 7/9/21	Mon 7/12/21	163,164,7
166		**Procurement**	**190 days**	**Fri 3/5/21**	**Thu 11/25/21**	
167		PR Long Lead Items	2 wks	Fri 3/5/21	Thu 3/18/21	158
168		Issue Order for Long Lead Items	0 days	Thu 3/18/21	Thu 3/18/21	167
169		Procurement of Long Lead Items (Valves)	9 mons	Fri 3/19/21	Thu 11/25/21	168
170		Procurement of Remaining Materials	4 mons	Tue 7/13/21	Mon 11/1/21	165
171		**Permitting and Approval**	**336 days**	**Fri 12/14/18**	**Fri 3/27/20**	
172		Private Land Acquisition	6 mons	Fri 12/14/18	Thu 5/30/19	3
173		OGC	6 mons	Mon 10/14/19	Fri 3/27/20	4
174		Indigenous Communities Consultation	6 mons	Mon 10/14/19	Fri 3/27/20	4



Project: Combined
Date: Wed 12/12/18

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
175		ALC Permit	6 mons	Mon 10/14/19	Fri 3/27/20	4
176		Federal Permits (Fisheries Act, Species at Risk Act)	6 mons	Mon 10/14/19	Fri 3/27/20	4
177		Municipal Permits	6 mons	Mon 10/14/19	Fri 3/27/20	4
178		Utility Permits	6 mons	Mon 10/14/19	Fri 3/27/20	4
179		Environmental/Archaeological Permits	6 mons	Mon 10/14/19	Fri 3/27/20	4
180		Landowners Notification	1 mon	Mon 10/14/19	Fri 11/8/19	4
181		Permits Obtained	0 days	Fri 3/27/20	Fri 3/27/20	173,174,175,176,177,178
182		**Construction**	**260 days**	**Tue 11/2/21**	**Mon 10/31/22**	
183		Fabrication	3.25 mons	Tue 11/2/21	Mon 1/31/22	181,170
184		Construction	152 days	Fri 4/1/22	Mon 10/31/22	183,19,172,181
185		Restoration/Clean up	1.15 mons	Sun 5/1/22	Tue 5/31/22	
186		In-Service Date	0 days	Mon 10/31/22	Mon 10/31/22	184
187		**Prince George Pulp, Husky Oil Lateral PRS**	**1164 days**	**Fri 12/14/18**	**Wed 5/31/23**	
189		**Prince George 2 219 Lateral PRS**	**1164 days**	**Fri 12/14/18**	**Wed 5/31/23**	
191		**Williams Lake Loop 168 PRS**	**1431 days**	**Fri 12/14/18**	**Fri 6/7/24**	
193		**Coldstream Lateral 219 PRS**	**1431 days**	**Fri 12/14/18**	**Fri 6/7/24**	
195		**Coldstream Loop 168 PRS**	**1431 days**	**Fri 12/14/18**	**Fri 6/7/24**	
197		**Kelowna 1 Loop 219 PRS**	**1431 days**	**Fri 12/14/18**	**Fri 6/7/24**	
199		**Celgar Lateral 168 PRS**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	
201		**Trail Lateral 168 PRS**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	
203		**Elkview Lateral 168 PRS**	**1540 days**	**Fri 12/14/18**	**Thu 11/7/24**	



Project: Combined
Date: Wed 12/12/18

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

Appendix N

FINANCIAL SCHEDULES

FILED CONFIDENTIALLY

Appendix N-1

AGGREGATED FINANCIAL SCHEDULES

FILED CONFIDENTIALLY

Appendix N-2

INDIVIDUAL FINANCIAL SCHEDULES

REFER TO LIVE SPREADSHEET MODELS

Provided in electronic format only

FILED CONFIDENTIALLY

Appendix O

ENVIRONMENTAL OVERVIEW ASSESSMENT REPORTS

(Provided in electronic format only due to
document size and in order to conserve paper)

Inland Gas Upgrades Project
Environmental Overview Assessment
Northern and Central BC Sub-Region

Prepared for:

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

File: No. 855-043.02

October 12, 2018

Prepared by:

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EXECUTIVE SUMMARY

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and include the replacement of 4 laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations (PRS) to manage the remaining 14 laterals. The existing 29 laterals are located in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3). This Environmental Overview Assessment (EOA) report presents Project environmental risks associated with Set 1, the Northern and Central sub-region.

The general study area for this EOA includes the length of the referenced laterals, with a 100 m width on either side of the lateral. A 500-m wide study area was used to assess potential wildlife and species at risk presence during desktop review.

A desktop assessment was completed for each lateral proposed for upgrading. The information gathered in the desktop assessment was used to identify environmental receptors of concern and to focus and refine the scope of preliminary field reconnaissance (PFR) activities undertaken to ground-truth information gathered at the desktop level. Information included in the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Data collection and PFR methods specific to each environmental receptor category are described within this report.

PFR work was undertaken by biologists from Eco-Web Ecological Consultants in May and June of 2018. The PFR supported the desktop assessments and gathered biophysical information for the study areas associated with laterals where ILI or pipeline replacement are the preferred engineering options. For laterals where PRS was the preferred option, field data was collected at the location of the proposed PRS station. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 1 laterals in the event additional ILI or replacement activities are required or should additional footprint be required (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active agricultural areas) were not visited during PFR, unless a reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

This report provides a high-level overview of the potential adverse effects to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities (i.e., where the anticipated construction footprint overlaps with identified features), and where factors present a risk to the Project. For the purposes of this report, risks to the Project include additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals). The following table is a summary of the Project risks identified for the Northern and Central sub-region.

Lateral (Upgrade Options)	Project Risk(s)											
	Preferred Option						Alternative Option					
	Environmental Receptors											
	Land Use	Surface Water Quality and Quantity	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites	Land Use	Surface Water Quality and	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites
MAC LTL 168 (ILI/PLR)_	Low	High	High	Low	Med	5 medium risk APECs	Low	High	High	Low	Med	9 medium risk APECs, 1 high risk APEC
MAC LOP 168 (ILI/PLR)	Low	Low	Nil	Low	Med	1 medium risk APEC	Low	High	High	Low	Med	1 medium risk APEC's
BCF LTL 168 (PLR/ILI)	Low	Nil	Nil	Low	Low	2 medium risk APEC's	Low	Nil	Nil	Low	Low	2 medium risk APEC's
NWP LTL 168 (PRS/ILI)	Low	Nil	Nil	Low	Low	No risk areas identified	Med	Low	Med	Med	Med	4 medium risk APEC's
NWP LOP 219 (PRS/ILI)	Low	Nil	Nil	Low	Low	No risk areas identified	Low	Low	Med	Med	Med	2 medium risk APEC's
PG3 LTL 219 (PRS/ILI)	Low	Nil	Nil	Low	Low	No risk areas identified	Low	High	High	Med	Med	1 medium, 1 high risk APEC
PG1 LTL 168 (ILI/PLR)	Med	Nil	Nil	Low	Med	No risk areas identified	High	High	High	Med	Med	1 medium risk APEC
PGP LTL 168 (PRS/PLR)	Low	Nil	Nil	Low	Low	No risk areas identified	Low	High	High	Low	Med	2 medium risk, 1 high risk APEC
HUS LTL 168 (PRS/PLR)	Med	Nil	Nil	Low	Low	3 medium risk, 1 high risk APEC's	Med	Nil	Nil	Low	Low	4 medium risk, 3 high risk APEC's
PG2 219 168 (PRS/ILI)	Low	Nil	Nil	Nil	Low	No risk areas identified	High	Med	Med	Med	Med	1 low, 1 medium APEC
CAR LTL 168 (PLR/PRS)	Low	Low	Low	Low	Low	1 medium risk APEC	Low	Nil	Nil	Low	Low	No risk areas identified
WIL LP1 168 / WIL LP2 168 (PRS/ILI)	Low	Nil	Nil	Low	Low	No risk areas identified	Med	Low	Med	Med	Med	1 medium risk APEC

This Executive Summary is not intended to be a stand-alone document, but a summary of findings as described in the following report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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This work was performed in accordance with Blanket Order Number: 4500052346 between Hemmera Envirochem Inc. (Hemmera) and FortisBC Energy Inc. (Client), dated March 13, 2018 (Contract) as well as the Inland Gas Upgrade Project – Change Order to Address Revisions to Upgrade Priorities, dated October 3, 2018. This report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by insert client name. In performing this work, Hemmera has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations

1.0 INTRODUCTION

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and includes the replacement of four laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations to manage the remaining 14 laterals. The existing 29 laterals are located in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3). This Environmental Overview Assessment (EOA) report presents Project environmental risks associated with Set 1, the Northern and Central BC sub-region.

To proceed, FortisBC requires a Certificate of Public Convenience and Necessity (CPCN) from the British Columbia Utilities Commission (BCUC) as per section 45(1) and 46(1) of the *Utilities Commission Act*. Hemmera Envirochem Inc. (Hemmera) was retained by FortisBC to prepare high level Environmental Overview Assessment (EOA) reports for the Project in support of the CPCN application.

The content of the EOA reports is intended to meet the CPCN application guidelines (BCUC 2015). As such, this report identifies environmental receptors in or adjacent to the expected footprint of the Project, potential impacts to those receptors, and environmental risks to be addressed or mitigated prior to and/or during construction (and in some cases post-construction). Most of these risks carry Project cost and schedule implications. The reports provide an overview of five main environmental receptor categories:

- Land use
- Contaminated sites (water and soil)
- Fish and fish habitat
- Vegetation (including invasive plants)
- Wildlife

Species at risk are addressed within the fish, vegetation and wildlife assessments.

1.1 Project Scope and Area

FortisBC identified preferred and alternative engineering options for each lateral. The Set 1 laterals and the associated preferred and alternative engineering options are listed in **Table 1.1**. The location of each lateral and anticipated construction footprints are shown in the Environmental Worksheets (**Appendix A**). The engineering options are described as follows:

- Pipeline replacement (PLR): The construction footprint is expected to be 30 m wide for the length of the pipeline. Pipeline replacement activities include:
  - Installation of a new pipeline in parallel with the existing pipeline
  - Deactivation and abandonment in place of the old line

- In-line inspection (ILI): The estimated construction footprint for each area of disturbance is expected to range from 50 square meters (m^2) to 500 m^2 depending on the associated activity. ILI upgrade activities include:
  - Installation of pig barrels at each end of the pipeline to allow ILI tools to be launched and received
  - Installation of control valve assembly stations
  - Replacement of non-ILI compatible sections and features such as bends, valves, tees, and stopple fittings
- Pressure regulating station (PRS). The construction footprint will be between 1,000 m^2 and 2,000 m^2, and includes:
  - Installation of a pressure regulating station at the start of the lateral

Table 1.1 Northern and Central BC ILI Lateral/Loop Summary

Full Name	Abbreviation	Length (km)	Preferred Option	Alternative Option
MACKENZIE LATERAL 168	MAC LTL 168	28.7	ILI	PLR
MACKENZIE LOOP 168	MAC LOP 168	14.2	ILI	PLR
BC FOREST PRODUCTS LATERAL 168	BCF LTL 168	0.5	PLR	ILI
NORTHWOOD PULP LATERAL 168	NWP LTL 168	6.0	PRS	ILI
NORTHWOOD PULP LOOP 219	NWP LOP 219	5.8	PRS	ILI
PRINCE GEORGE 3 LATERAL 219	PG3 LTL 219	5.3	PRS	ILI
PRINCE GEORGE 1 LATERAL 168	PG1 LTL 168	4.7	ILI	PLR
PRINCE GEORGE PULP LATERAL 168	PGP LTL 168	1.0	PRS	PLR
HUSKY OIL LATERAL 168	HUS LTL 168	1.1	PRS	PLR
PRINCE GEORGE 2 LATERAL 219	PG2 219 168	8.7	PRS	ILI
CARIBOO PULP LATERAL 168	CAR LTL 168	1.3	PLR	PRS
WILLIAMS LAKE LOOP (1) 168	WIL LP1 168	3.4	PRS	ILI
WILLIAMS LAKE LOOP (2) 168	WIL LP1 168	2.5	PRS	ILI

Note: ILI = In-line Investigations; PLR = Pipeline Replacement; PRS = Pressure Regulating Stations

Anticipated construction activities associated with the Project construction phase are outlined below:

- Site preparation:
  - Mobilization and demobilization of construction equipment and materials
  - Storage of construction equipment and materials
  - Development of temporary and permanent workspaces
  - Right of Way (RoW) clearing and widening (vegetation clearing and grubbing)
- Trench, pit, or site excavation:
  - Removal of asphalt
  - Stripping of topsoil
  - Site grading
  - Trench excavation
  - Stream crossings including trenchless (e.g., horizontal directional drilling (HDD)) or open-cut crossing methods
- Material stockpiling and disposal:
  - Stockpiling of excavated materials
  - Disposal of contaminated soil
- Pipe/features installation/ PRS construction and hydrostatic testing:
  - Installation of pipeline features
  - Construction of PRS
  - Potential concrete pouring
  - Backfilling and covering the trench
  - Capping and filling of installed sections of pipeline with hydrostatic test water
    - Water may be drawn from municipal sources or potentially from nearby aquatic features
    - Disposal/discharge of hydrostatic test water
- Water quality and quantity management
  - Pumping and discharge of groundwater encountered during excavation (or from surface water sources)
  - Treatment of contaminated or sediment-laden water prior to discharge to aquatic habitat
- Landscape restoration
  - Grading and smoothing of the ground surface
  - Placement of topsoil
  - Hydroseeding or replanting of groundcover
  - Potential stream channel and riparian habitat restoration
- Maintenance and operations
  - Vegetation management
  - Invasive vegetation removal

2.0 METHODS

The general study area for this EOA includes the length of the referenced laterals as outlined in **Table 1.1**, with a 100 m width on either side of the lateral. This 100 m study area facilitates gathering sufficient information to meet OGC requirements, which will be important for the future permitting phase of the Project. A 500-m buffer was used to determine known wildlife use and to assess potential species at risk presence during desktop review.

A desktop assessment was completed for each lateral (**Section 3.0**). Information gathered during the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Information sources used in the desktop assessment are listed in **Table 2.1.** The information gathered in the desktop assessment was used to identify potential risks associated with each of the environmental receptors and to focus and refine the scope of Preliminary Field Reconnaissance (PFR) undertaken to ground-truth the information gathered during the desktop assessment. Data collection and PFR methods specific to each environmental receptor category are described in the sub-sections below.

Table 2.1 Desktop Information Sources

Data Source	Information Reviewed	Data Access Date
Federal		
Species at Risk Public Registry (SARA)	Review of federally listed species at risk with identified critical habitat not included in the critical habitat spatial data available from DataBC (i.e., species with recovery strategies posted after August 2017)	April 2018
Environment and Climate Change Canada (ECCC)	Critical habitat for snake species (spatial data not yet available through BC Data Catalogue)	April 2018
Committee of the Status of Endangered Wildlife in Canada (COSEWIC)	Assessment Reports (range and habitat requirements) of species of concern identified with potential to occur within study area	March – April 2018
Federal Contaminated Sites Registry	All known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment	April – June 2018

Data Source	Information Reviewed	Data Access Date
Provincial		
BC Conservation Data Centre (BC CDC)	Data provided for masked (i.e., confidential) species at risk occurrences within the study area	
BC Data Catalogue	Agricultural capability mapping Agricultural Land Reserve (ALR) boundary Biogeoclimatic Ecosystem Classification (BEC) map CDC element occurrences – (masked/sensitive and public occurrences) Community Watersheds – current Critical habitat for federally-listed species at risk (posted) Freshwater Atlas (man-made waterbodies, rivers, stream network and lines, wetlands); Invasive Alien Plant Site (i.e., known locations of noxious weeds) Known BC fish observations Municipal boundaries Old Growth Management Areas Parcel Map BC Parcel Fabric (to determine lot boundaries and land ownership) Parks and Protected Areas Roads Ungulate Winter Range (approved) Vegetation Resource Inventory (VRI) - forest vegetation composite polygons and Rank 1 layer (review of age class to determine presence of old growth forest) Wildlife Habitat Areas (approved)	February – April 2018
BC Weed Control Regulation	Review of provincially and regionally designated noxious weeds	March 2018
BC Site Registry	The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*.	April – June 2018
Regional/Municipal		
City of Quesnel, City of Prince George	Online map applications where available Review of potentially applicable municipal by-laws	March 2018
District of Mackenzie, City of Williams Lake	Review of potentially applicable municipal by-laws	March 2018
Regional District of Fraser-Fort George, Cariboo Regional District	Review of potentially applicable municipal by-laws	March 2018
Other		
Hemmera's Species at Risk Technical Expert	Internal proprietary database (compilation of occurrence and observation records) of species at risk occurrences data within BC	April 2018
FortisBC	Lateral alignment	March 23, 2108
	Lateral details (including locations of bends, valves, tees, stopples, etc.)	April 30, 2018

Data Source	Information Reviewed	Data Access Date
Bing, ESRI, Google	Ortho-imagery	February – April 2018
eFlora and eFauna	Atlas pages (range and habitat requirements) of species at risk identified to have potential to occur within study area	April – June 2018
Stantec (via FortisBC)	Construction details of Pressure Regulation Sites	May 14, 2018
Wildlife Tree Stewardship Atlas (WiTS)	Review of the bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) nest registry	April 2018
BirdLife International	Important Bird Area maps	April 2018
Nature Trust British Columbia Properties Web App	Properties owned by the Nature Trust of British Columbia	March 2018
Ecolog ERIS Report	Search of 49 environmental databases	April – June 2018
UBC Geographic Information Centre	Historical aerial photographs	April – June 2018

PFR work was undertaken by biologists from Eco-web Ecological Consultants in May and June of 2018. The PFR supported the desktop assessments and gathered additional biophysical information for the study areas associated with laterals where ILI or PLR are the preferred engineering options. For laterals where PRS was the preferred option, field data was only collected at the end of the lateral where the proposed PRS would be constructed. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 1 laterals in the event additional ILI or replacement activities are required or should additional footprint be required (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active agricultural areas) were not visited during PFR, unless a reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

The dates and areas assessed during PFR are outlined below:

- MAC LTL 168 and MAC LOP 168: May 24 to 27, 2018. Existing lateral alignment was traversed using ATV's from south to north
- BCF LTL 168: May 26, 2018. Existing lateral alignment was assessed on foot from east to west
- NWP LTL 168, NWP LOP 219 and PG3 LTL 219: May 30, 2018. Site #1 (PRS) was assessed on foot
- PG1 LTL 168: May 28 and 30, 2018. Existing lateral alignment was assessed on foot and via ATVs from west to east[1]
- PGP LTL 168: May 28 and 30, 2018: Existing lateral alignment was assessed on foot from south to north

[1] At the time of field studies, the preferred option for this lateral was thought to be ILI, thus the entire alignment was assessed

- HUS LTL 168: May 27 and 30, 2018. Existing lateral alignment was assessed on foot from west to east[2]
- PG2 219 168: May 28, 2018. Site #2 (PRS) was assessed by vehicle
- CAR LTL 168: May 29, 2018. The east end of the lateral was assessed by ATVs[3]
- WIL LP1 168: May 29, 2018: Site #4 (PRS) was assessed by vehicle

Representative photos were taken at environmental points of interest (e.g., watercourses, wildlife features, vegetation features) and at regular reference points (i.e., approximately every 200 m where access permitted). Select photos of key features are provided in a photo log (**Appendix B**). Additional reference photos are available upon request.

2.1 Land Use

Land use resources from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- General ownership of land (e.g., federal, provincial Crown, municipal, private)
- Regional districts and municipalities
- Parks and protected areas
- ALR areas and the number of properties within the ALR intersected by the lateral
- Agricultural land capability classification of soils within the ALR (classes range from 1 to 7, with Class 1 land being capable of producing a wide range of crops on deep, well-drained, level soils, to Class 7 land with no capability for agriculture, such as bedrock and non-soil areas (MOE 1983)

During PFR, any areas where land use was observed to be different from the aerial imagery used for mapping and desktop analysis was recorded and geographically referenced.

2.2 Contaminated Sites (Water and Soil)

A desktop assessment was completed for each of the laterals to identify APECs where contaminated soil and groundwater may be encountered during proposed construction activities. To identify APECs, Ecolog ERIS reports and current and historical aerial photographs were reviewed to identify potentially contaminated sites. Subsequently, site visits were conducted during PFR activities, focusing on suspect sites where past/present land use and operations were indeterminable through review of historical photographs and record searches.

The Ecolog ERIS reports included a search of 49 environmental databases for record entries within 250 m of the laterals, of which the most relevant are the following:

- Authorization Management System (formerly WASTE)
- BC Ministry of the Environment and Climate Change Strategy (MOE) Online Site Registry
- Chemical Register
- Environmental Issues Inventory System

[2] At the time of field studies, the preferred option for this lateral was thought to be ILI, thus the entire alignment was assessed

[3] At the time of field studies, the preferred option for this lateral was thought to be PRS, thus only the east end of the lateral was visited.

- Federal Contaminated Sites Inventory (FCSI)
- National Environmental Emergencies System
- National PCB Inventory (federal) and Inventory of PCB Storage Sites (provincial)
- National Pollutant Release Inventory (NPRI)
- Oil and Gas Wells
- Retail Fuel Storage Tanks
- Scott's Manufacturing Directory
- Special Waste Information System
- Waste Disposal Site Inventory
- Waste Generators Summary
- Waste Receivers Summary
- Wastewater Discharge Inventory

The primary databases were relied on to identify known and potentially contaminated sites were the BC MOE Online Site Registry and the FCSI. The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*. Where Site Registry results were identified within 50 m of the laterals, Detailed Registry Reports were requested to gather additional information. The FCSI includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations, as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility.

Historical aerial photographs sourced from Natural Resources Canada's National Air Photo Library, were requested through Ecolog ERIS and reviewed to identify operations that were potential APECs. Where significant gaps were present in the years of available aerial photos, or the quality of available aerial photos was poor, supplemental aerials were requested from the University of British Columbia Geographic Information Centre. Each of the laterals were also reviewed using current and historical aerial and street view photography available in Google Earth.

Where site visits were completed, the laterals and adjacent properties were assessed for potentially contaminating operations (e.g., auto repair, manufacturing, gas stations, industrial operations, etc.), evidence of underground or aboveground storage tanks (UST or AST), waste dumping or landfilling, previous environmental investigations (e.g., groundwater monitoring wells) and storage of hazardous materials. The results of the site visits were then cross-referenced with the information gathered during the desktop assessment to determine which areas constitute APECs.

Each of the identified APECs were then assigned a risk-ranking of low, medium or high based on the likelihood of the operation having caused contamination in soil or groundwater within or near the existing lateral alignment. The factors considered when determining the likelihood included:

- Type and mobility of potential contaminants (metals vs hydrocarbons, etc.)
- Geographic location of the site or operation (downgradient vs upgradient)
- Age of potentially contaminating operations (older operations increase likelihood)
- Sophistication of operation (likelihood to have environmental policies)

When assigning a risk-ranking, the scale of the operations, distance from the lateral, the local topography and inferred groundwater flow direction, and the source and mobility of PCOCs were considered. The risk rankings can be further described as follows:

- Low-risk – Potentially contaminating operations were identified but are unlikely to have resulted in contamination within the Project alignment. Additional assessment work is not recommended to characterize the risk associated with each of the low-risk sites and there is not expected to be a cost for site management during Project construction. Should unexpected impacts be identified during the Project related to low risk areas, appropriate investigation and management activities would be assessed and completed at that time
- Medium-risk - Potentially contaminating operations were identified that are likely to have resulted in some level of contamination within a portion of the Project alignment; although, the nature of the concern and proximity/location of the site may limit the overall liability during the construction phase. Further assessment is recommended to characterize the risk within each of the medium-risk APECs and there is expected to be a cost for site management during Project construction
- High-risk – Operations with significant potential for contamination or confirmed contaminated sites that are likely to have resulted in contamination over a majority of the Project alignment width and further work would be required to determine the extent of the potential liability. Further assessment work is recommended to define the risk associated with each of the high-risk sites and there is expected to be a cost for site management during Project construction

A summary of the findings of the desktop assessment for each lateral are provided in **Section 2.0**, and the APECs and affected segments of the laterals are presented on **Figures NC-1** to **NC-46.**

2.3 Fish and Fish Habitat

For the purposes of this report, fish habitat assessment includes all permanent and intermittent waterbodies and associated riparian vegetation within the 100 m study area.

A desktop review was conducted to obtain existing data on fish and fish habitat prior to PFR. Data was compiled from the following sources:

- Fisheries Information Summary System (MOE 2017)
- BC Species and Ecosystem Explorer (BC CDC 2018)
- COSEWIC (Government of Canada 2018)
- Aquatic Species at Risk online database (DFO 2018)
- HabitatWizard, iMapBC, and Freshwater Atlas (FWA) online mapping databases (DataBC 2018)
- Municipal and regional district online map data, where available

Fish species of concern with the potential to occur in the study area for each lateral were also identified. For the purposes of this report, fish species of concern were defined as species that are listed under federal SARA, and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)). To determine the potential presence of species and ecological communities of concern, a query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify fish species known to occur in the BEC zones that overlap with an expanded 500 m study applied to each lateral. The list of at-risk species was further refined based on their current known range and habitat suitability for each species assessed during the desktop studies and based

on information gathered during PFR. Each species was then ranked according to its potential to occur within the study area (i.e., nil, low, medium, or high[4]). **Appendix C** provides species-specific details on their range, habitat requirements and their assessed potential to occur. **Table 2.1** provides a list of information sources that were queried during this process. Fish species of concern that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report. A search for known occurrences of fish species of concern, and species with federally-designated critical habitat within the study area was conducted within the study area for each lateral.

During PFR activities, streams intersecting the study area were generally accessed by foot or vehicle on existing road infrastructure. Biophysical measurements (e.g., stream width, depth, gradient, and substrate type) were collected for each watercourse where it crossed the lateral, or at the nearest accessible location of select watercourses where lateral crossings were not accessible to field crews. Obstructions to fish passage, unique channel characteristics (e.g., flood channels, braids, secondary channels, wetlands, bogs, depressions, etc.), and any other notable habitat features were also identified and recorded. Active fish sampling within the watercourses was not conducted during PFR activities.

Watercourse classification varies between regions and municipalities. Riparian setbacks for watercourses were calculated based on the applicable legislation within each municipality (e.g., municipal and regional bylaws). Outside of municipal boundaries, the *Forest and Range Protection Act* (FRPA) stream classification model was used. Riparian Management Areas (RMA) were calculated for watercourses within all other areas (**Table 2.2**). All riparian setbacks (e.g., municipal or RMA) were calculated from the top of the stream bank. Riparian setbacks were calculated for watercourses along laterals with ILI or PLR as the main engineering option. However, riparian setbacks may not be required based on actual construction footprints, if a development permit is required, or current land use (e.g., ALR).

Where fish presence was unknown, the stream was conservatively classified as fish-bearing.

Table 2.2 RMA Widths (FRPA) for Streams, Wetlands, and Lakes

Riparian Class	Watercourse Description	Riparian Management Area (m)
Streams		
S1A	≥ 100 m stream or active flood plain width; fish bearing	100
S1B	> 20 m width; fish bearing	70
S2	5 – 20 m width; fish bearing	50
S3	1.5 – < 5 m width; fish bearing	40
S4	< 1.5 m width; fish bearing	30
S5	> 3 m width; non-fish bearing	30

[4] **Nil**: current understanding of the species' range and/or known species habitat associations suggests the species is not expected to occur within the study area. Species occurrence in the study area would be considered accidental. **Low**: current understanding of the species' range and/or known species habitat associations suggests that the species is unlikely to occur within the study area with regularity or in adequate density to facilitate a functional population. Several ecological life-requisite stages would be challenged based on existing habitat conditions in the study area and/or connectivity with larger, more contiguous occurrence of the species. **Medium:** current understanding of the species range and/or known species habitat associations suggests that the species is expected to occur in the study area on a temporary or regular (i.e., predictable) seasonal basis and in densities that facilitate persistence of a functional population within the study area. **High:** current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the study area regularly, and in densities that would be expected to occur in provincial benchmark habitats.

Riparian Class	Watercourse Description	Riparian Management Area (m)
S6	≤3 m width; non-fish bearing	20
Wetlands		
W1	> 5 ha	50
W2	1 – 5 ha in PP, BG, IDF (xh, xw, xm), CDF, CWH (xm, dm, ds)	30
W3	1 - 5 ha in a biogeoclimatic zone or subzone other than one mentioned in W2	30
W4	• 0.25 – 1 ha in PP, BG, IDF (xh, xw, xm); or • 0.5 - 1 ha in CDF, CWH (xm, dm, ds)	30
W5	• two or more W1s within 100 m • a W1 and one or more non-W1 within 80 m • two or more non-W1s within 60 m • the combined area of wetlands is >= 5 ha	50
Lakes		
L1-A	≥ 1,000 ha	0
L1-B	5 - 1,000 ha	10
L2	1 - 5 ha in PP, BG, IDF (xh, xw, xm), CDF, CWH (xm, dm, ds)	30
L3	1 - 5 ha in a biogeoclimatic zone or subzone other than one mentioned above	30
L4	• 0.25 – 1 ha in PP, BG, IDF (xh, xw, xm); or • 0.5 - 1 ha in CDF, CWH (xm, dm, ds)	30

Adapted from the *Forest and Range Practices Act*: Forest Planning and Practices Regulation (2004)

2.4 Vegetation

Vegetation resources from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- BEC zones and subzones
- Areas of forest cover and dominant tree species (through analysis of aerial imagery and VRI polygons)
- Areas of old growth forest stands. For the purposes of this report, old growth was defined as:
  - Approved Old Growth Management Areas (OGMAs)
  - Stands with leading species with a projected age class of 8 or 9, depending on the Natural Disturbance Type of the BEC unit they in which they were found (BC MOFR and BC MELP 2010)
- Federally identified Critical Habitat for plant species at risk
- Known locations of invasive plants

Plant species and ecological communities of concern with the potential to occur in the study area for each lateral were also identified. For the purposes of this report, species and ecological communities of concern were defined as species that are listed under federal SARA and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)).

To determine the potential presence of species and ecological communities of concern, a query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify plant species and ecological communities that are known to occur in the BEC zones (species) and subzones (communities) that overlap with the 100 m study area for each lateral. The list of species was further refined based on the range and habitat suitability of each species and information collected during PFR. Species were ranked according to their potential to occur in the study area (i.e., nil, low, medium, or high).

Species-specific details on range and habitat requirements and their assessed potential to occur is provided in **Appendix C**. Species that were determined to have a medium or high potential for occurrence within the study area are presented in the body of this report. Information regarding ecological communities is generally less-available than for individual species; therefore, ecological communities were not ranked according to potential for occurrence. All ecological communities identified within a BEC subzone that overlaps with the study area for a particular lateral were included within the report. A search for known occurrences of provincially red- or blue-listed species and communities, and species with federally designated critical habitat was conducted within the study area for each lateral.

Preliminary field reconnaissance activities collected data on vegetation community assemblage along the laterals. Areas of invasive or noxious weeds within or immediately adjacent to the ROW were recorded and geographically referenced. Areas of unique habitats encountered along the ROW that were considered to have potential to support at-risk plant species (e.g., areas of old growth forest, wetlands, rocky outcrops and seeps) were recorded and geographically referenced.

2.5 Wildlife

Wildlife values from **Table 2.1** were reviewed within an expanded (relative to vegetation) 500-m study area for each lateral. This expanded study area was used to provide a conservative zone to identify recorded occurrences of species at risk, especially motile species (e.g., birds). Desktop studies identified the following designations and features when they occurred within the study area for each lateral:

- Important Bird Areas
- Approved Wildlife Habitat Areas (WHAs)[5]
- Wildlife Management Areas (WMAs)
- Approved Ungulate Winter Ranges (UWRs)
- Previously mapped locations of osprey and bald eagle nests
- Federally identified critical habitat for species at risk

[5] Proposed WHAs were not included as a consideration as management afforded to proposed WHAs is restricted to conservation of the wildlife habitat feature within each WHA. Where interim measures are required to ensure protection of a wildlife habitat feature within a proposed WHA the BC MFLNRORD is responsible for providing written notification to all affected parties, of the location and protection allotted to the wildlife habitat feature during the consultation phase of WHA designation. The request will solicit voluntary protection consistent with the candidate general wildlife measures. If no such request has been advanced there is no requirement for interim protection ((MWLAP 2004*a*))

Wildlife species of concern with the potential to occur in the study area for each lateral were also identified. For the purposes of this report, wildlife species of concern were defined as species that are listed under federal SARA, species whose nests are afforded specific consideration under Section 34b of the *Wildlife Act,* and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)). A query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify fish species known to occur in the BEC zones that overlap with an expanded 500 m study applied to each lateral. The list of at-risk species was further refined based on their current known range and habitat suitability for each species assessed during the desktop studies and based on information gathered during PFR. Each species was then ranked according to its potential to occur within the study area (i.e., nil, low, medium, or high). **Appendix C** provides species-specific details on their range, habitat requirements and their assessed potential to occur. **Table 2.1** provides a list of information sources that were queried during this process. Wildlife species of concern that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report. A search for known occurrences of wildlife species of concern, and species with federally-designated critical habitat within the study area was conducted within the study area for each lateral.

During the PFR, observations of wildlife of concern and wildlife habitat features (e.g., raptor or heron nests, bird colonies, mineral licks, wallows, dens, burrows, and wildlife trees, etc.) were recorded, described and geographically referenced. Activity, behaviour and species abundance, where evident and relevant, was also noted.

3.0 OVERVIEW OF EXISTING ENVIRONMENT

A description of the existing conditions relevant to each of the five environmental receptor categories is provided in the following sub-sections for each lateral in Set 1. Information collected during the desktop assessment and the PFR surveys is summarized below. Pertinent spatial environmental data (e.g., waterbodies, land use zoning, APECs) is presented on a set of Environmental Worksheets prepared for each lateral in **Appendix A**.

3.1 MAC LTL 168

MAC LTL 168 is 28.7 km long, oriented in an approximately south to north direction with the south end located near the junction of Highway 97 and Highway 39, and the north end in Mackenzie, BC (**Figures NC-02** to **NC-23)**.

MAC LTL 168 was assessed in conjunction with MAC LOP 168 (**Section 3.2**) over a four-day period from May 24 to 27, 2018. The lateral alignments were assessed with the use of ATVs starting at the FortisBC Mackenzie TAP - Odorant Station (Site #4) at the south end and heading north to the FortisBC Mackenzie Gate Station. The southern three quarters of the existing alignment passes through mature conifer forest stands and previously forested harvested areas; the northern quarter passes an industrial area before terminating at a residential neighbourhood.

Reference photos were taken along the lateral at intervals of approximately 200 m, additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.), areas where the land use or ecology changes, wildlife and vegetation feature locations, and at watercourse crossings. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.1.1 Land Use

MAC LTL 168 is located in a mix of forested areas and early seral stage harvested area, roughly paralleling Highway 39 and CN railway tracks from Highway 97 to the Mackenzie Pulp Mill. North of the pulp mill, the lateral crosses a mix of industrial and undeveloped lands and runs along the west side of the Mackenzie Airport. The north terminus is in the community of Mackenzie, BC. A summary of the land use within the study area is provided in **Table 3.1**.

Table 3.1 Overview of Land Use within the MAC LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Class
Crown Agency: 51.6 **Municipal**: 4.0 **Private**: 90.3 **None**: 93.7	Fraser-Fort George	Mackenzie	Demonstration Forest Trails Recreation Site, near where the RoW crosses Highway 39 at chainage 11+50 (Government of BC 2018, OpenStreetMap 2018)	-	-	-

3.1.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along MAC LTL 168 are provided in **Table 3.2**. A total of nine sites were identified with a medium-risk classification and one with a high-risk classification. Seven of the ten sites were associated with railway crossings or railway property.

Table 3.2 Summary of Areas of Potential Environmental Concern for Lateral MAC LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
MAC LTL 168 (Inland Gas Upgrade Project)							
A1	Scrap yard and machinery parking (1010 and 1020 Frontage Road, Mackenzie)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Site Reg (ID 11751)	Adjacent	Medium	200	NC-04
A2	Automobile scrap yard (Cooper Road, MacKenzie)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Aerial imagery	On-site	High	300	NC-04
A3	Waste collection - Clean Harbours (5100 Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Aerial imagery	Adjacent	Medium	200	NC-04
A4	Railyard with Site Registry entry (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Site Reg (ID 13640)	Adjacent	Medium	50	NC-04 and NC-05
A5	Railway crossing (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	20	NC-05
A6	Railway crossing (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	10	NC-06
A7	Pile of railway ties (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Field visit	On-site	Medium	35	NC-06
A8	Railway crossing (west of Old Airport Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	40	NC-06

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
A9	Railway crossing (north of river crossing, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	15	NC-06
A10/C1	Railway crossing (west of Hwy 39 and north of Mischinsinlika Creek, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	75	NC-14

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VPH – Volatile Petroleum Hydrocarbons
Site Reg – BC ME Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
FCSI – Federal Contaminated Sites Inventory

3.1.3 Fish and Fish Habitat

Seventeen FWA mapped watercourses were identified within the MAC LTL 168 study area during desktop analysis. During PFR activities, three FWA mapped watercourses were observed to have no identifiable stream channel; and an additional two unmapped water features (e.g., wetlands) were observed and subsequently mapped. A total of sixteen watercourses potentially require riparian setbacks. Four isolated bodies of standing water were observed along the existing alignment; these are not fish habitat and do not require riparian setbacks.

Watercourses MAC LTL 168_001 to MAC LTL 168_014 are within the District of Mackenzie, which does not have a municipal riparian setback bylaw (**Section 4.8.1**). All the watercourses are within the Fraser-Fort George Regional District, which requires 15 m horizontal setbacks for streams, 7.5 m setbacks for marshes or ponds, and 15 m setbacks for lakes unless otherwise stated (**Section 4.7.1**). It is recommended the more conservative provincial FRPA RMA setbacks are observed.

Waterbodies are summarized in **Table 3.3** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with medium potential to occur within the study area (**Table 3.4**). This species does not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.3 Summary of Waterbodies within the MAC LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_MAC LTL 168_001	Wetland	45	UKN	Yes	W1	15	NC-02
NC_MAC LTL 168_002	Lake	55	UKN	Yes	L3	15	NC-02
NC_MAC LTL 168_003 (Chichouyenily Creek)	Stream - permanent	0	Yes	Yes	S2	15	NC-03
NC_MAC LTL 168_004 (Williston Lake)	Lake	0	Yes	Yes	L1-A	15	NC-07 NC-08
NC_MAC LTL 168_005-S	Stream - permanent	0	Yes	Yes	S1B	70	NC-10
NC_MAC LTL 168_005-L	Lake	6	Yes	Yes	L1-B	10	NC-10
NC_MAC LTL 168_006-S	Stream	0	UKN	Yes	S4	30	NC-11
NC_MAC LTL 168_006-W	Wetland	0	UKN	Yes	W1	50	NC-11
NC_MAC LTL 168_007	Wetland	0	UKN	Yes	W1	50	NC-11
NC_MAC LTL 168_008 (Gataiga Creek)	Stream - permanent	0	Yes	Yes	S2	50	NC-13
NC_MAC LTL 168_009 (Mischinsinlika Creek)	Stream - permanent	0	Yes	Yes	S1B	70	NC-14
NC_MAC LTL 168_010	Wetland	57	UKN	Yes	N/A*	N/A	NC-15
NC_MAC LTL 168_011 (Buth Creek)	Stream - permanent	0	UKN	Yes	S3	40	NC-16
NC_MAC LTL 168_012-ds	Stream - intermittent	0	UKN	Yes	S3	40	NC-16 NC-17
NC_MAC LTL 168_012-us	Stream - permanent	0	UKN	Yes	S3	40	NC-17
NC_MAC LTL 168_013	Stream - permanent	0	UKN	Yes	S3	40	NC-17
NC_MAC LTL 168_014	NSCI	0	UKN	Yes	N/A	N/A	NC-18

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_MAC LTL 168_015	NSCI	0	UKN	Yes	N/A	N/A	NC-19
NC_MAC LTL 168_016	NSCI	0	UKN	Yes	N/A	N/A	NC-21
NC_MAC LTL 168_017	Stream - permanent	0	UKN	Yes	S4	30	NC-22
NC_MAC LTL 168_018	wetland	20	UKN	No	W3	30	NC-03
NC_MAC LTL 168_019	Wetland	10	UKN	Yes	W1	50	NC-12
NC_MAC LTL 168_020	NCD	0	N	No	N/A	N/A	NC-10
NC_MAC LTL 168_021	NCD	0	N	No	N/A	N/A	NC-17
NC_MAC LTL 168_022	NCD	0	N	No	N/A	N/A	NC-14
NC_MAC LTL 168_023	NCD	0	N	No	N/A	N/A	NC-15

0 = crosses lateral; NCD = non-classified drainage; NSCI = no stream channel identified; N/A = not applicable; UKN = Unknown
* Less than 5 ha in SBS biogeoclimatic zone; therefore, have no FRAP wetland classification.

Table 3.4 Fish Species of Concern with Medium or High Potential to Occur within the MAC LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Y	-	High

3.1.4 Vegetation

The MAC LTL 168 study area is located within the transition zone between the Sub-Boreal Spruce Moist Cool (SBSmk) and Wet Cool (SBSwk) subzones. The southern 14 km of this lateral is located within the SBSwk subzone and the northern 17 km located in the SBSmk subzone (Meidinger et al. 1991). Both subzones are common in central BC from valley bottoms to elevations of up to 1300 m. These subzones are dominated by upland boreal forest, with hybrid white spruce (*Picea engelmannii x glauca*) and subalpine fir (*Abies lasiocarpa*) as common climax species, and lodgepole pine (*Pinus contorta var. latifolia*), trembling aspen (*Populus tremuloides*), and paper birch (*Betula papyrifera*) as common early seral species (Meidinger et al. 1991).

As a result of logging activity, a mosaic of forested habitats are present within the study area, including deciduous, mixed, and coniferous forest. Age classes of forest stands range from early seral harvested area (i.e., age class 1) to old growth forest (i.e., class 8) (DataBC, 2018). Dominant species present include those listed above, as well as alder (*Alnus spp.)* and willow (*Salix spp.)*. No approved OGMAs were identified within the study area during the desktop studies; however, several stands of old growth forest (i.e., class 8) covering an area of approximately 70.2 ha are shown by the VRI within the study area (DataBC 2018). Based on review of recent aerial imagery (Google Maps) and field data, it appears that several of these mapped old growth stands have been logged recently.

No invasive vegetation was identified in the study area during the desktop search or PFR.

Desktop studies did not identify any plant species of concern with medium or high potential to occur within the study area. No plant species of concern have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Twenty-one at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.5**). None of these at-risk ecological communities have known occurrences of at-risk ecological communities within the study area (DataBC 2018).

Table 3.5 At-Risk Ecological Communities with Potential to Occur in the MAC LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Narrow-leaved cotton-grass - shore sedge	*Eriophorum angustifolium - Carex limosa*	-	-	Blue	Yes	X
Tamarack / water sedge / golden fuzzy fen moss	*Larix laricina / Carex aquatilis / Tomentypnum nitens*	-	-	Blue	Yes	X
Hybrid white spruce / hardhack / oak fern	*Picea engelmannii x glauca / Spiraea douglasii / Gymnocarpium dryopteris*	-	-	Red	Yes	X
Black spruce / skunk cabbage / peat-mosses	*Picea mariana / Lysichiton americanus / Sphagnum spp.*	-	-	Blue	Yes	X
Black spruce / buckbean / peat-mosses	*Picea mariana / Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Lodgepole pine / black huckleberry - velvet-leaved blueberry	*Pinus contorta / Vaccinium membranaceum - Vaccinium myrtilloides*	-	-	Blue	Yes	X
(Balsam poplar, black cottonwood) - spruces / red-osier dogwood	*Populus spp. (balsamifera, trichocarpa) - Picea spp. / Cornus stolonifera*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Sitka willow / Sitka sedge	*Salix sitchensis / Carex sitchensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus Deep Marsh*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X
Tufted clubrush / golden star-moss	*Trichophorum cespitosum / Campylium stellatum*	-	-	Blue	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a particular community can be found within BEC subzones present within the study area.

3.1.5 Wildlife

The MAC LTL 168 study area does not overlap with any IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018). No raptor nests were identified during desktop studies (WiTS 2018); however, 13 large, conspicuous stick nests (including six active osprey (*Pandion haliaetus*) nests) were detected and described during PFR. Several additional wildlife observations were also identified, recorded and described during the PFR (**Table 3.6**).

A variety of wildlife habitat is present within the study area, including deciduous, mixed and coniferous forest patches, with stand age ranging from early seral stages (i.e., age class 1) to old growth forest (i.e., age class 8 or 9). Additional habitat types present include cleared RoWs, riparian and wetland habitats. These habitat types provide security for wildlife for movement (including migration and dispersal), foraging, and nesting. The habitat available within the study area is suitable for use by a variety of wildlife, including several wildlife species of concern.

Desktop studies identified 11 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.7**). The central mountain population of caribou has known occurrences within or adjacent to the study area (DataBC 2018). These occurrences are included within the range of the Scott and Kennedy Siding caribou herds and overlap with most of the study area. During desktop assessment, caribou were considered to have a low potential to occur, in consideration of the type and condition of available habitat present within the study area (i.e., lower elevation forested habitat largely impacted by logging activity).

No federally designated critical habitat polygons occurred within, or overlapped, the study area (including caribou) (DataBC 2018). Similarly, there were no mapped masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.6 Wildlife and Wildlife Habitat Features Observed in the MAC LTL 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 20 m from RoW on a power pole	NC-22
W002	Earthen burrow / den (unidentified) under tree root. Approximately 10 cm by 20 cm. Located on edge of RoW	NC-19
W003	Unidentified stick nest that appeared to be inactive at the time of PFR. Located on power pole	NC-17
W004	Western toad observation in wet area along RoW	NC-17
W005	Western toad observation in creek overflow area along RoW	NC-17
W006	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 10 m from RoW on a power pole	NC-13
W007	Active osprey nest. Two adults present at nest during PFR. Located approximately 10 m from the RoW on a power pole	NC-13
W008	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 10 m from the RoW on a power pole	NC-12
W009	Active osprey nest. Two adults present at nest during PFR. Located approximately 20 m from the RoW on a power pole	NC-11
W010	Active osprey nest. Two adults present at nest during PFR. Located approximately 20 m from the RoW on a power pole	NC-09
W011	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 5 m from the RoW on a power pole	NC-09
W012	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 5 m from the RoW on a power pole	NC-09
W013	Active osprey nest. One present at nest during PFR. Located directly off the RoW on a power pole	NC-08
W014	Active osprey nest. Two adults were occupying the nest during PFR. Located approximately 10 m from the RoW on a power pole	NC-06
W015	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 25 m from RoW on powerline	NC-06

Table 3.7 Wildlife of Concern with Medium or High Potential to Occur in the MAC LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Grizzly Bear	*Ursus arctos*	SC (2002)	1-SC (2018)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	Medium
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of “species of concern” as described in methods; however, was included in consideration of the high regional concern surrounding this species.

3.2 MAC LOP 168

MAC LOP 168 is 14.2 km long and parallels the MAC LTL 168 from its southern end near Highway 97 to the north end at the Mackenzie Lateral & Loop Tie-in 1 Crossover Plant (**Figures NC-15** to **NC-23**).

MAC LOP 168 was assessed in conjunction with MAC LTL 168 (**Section 3.1**) over a four-day period from May 24 to 27, 2018. The existing alignments were assessed with the use of ATVs starting at the FortisBC Mackenzie TAP - Odorant Station (Site #4) at the south end and heading north to the FortisBC Mackenzie Gate Station. This lateral passes through mature conifer forest stands and previously forested harvested areas.

Reference photos were taken along the lateral at intervals of approximately 200 m, additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.), areas where the land use or ecology changes, wildlife and vegetation feature locations, and at watercourses. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.2.1 Land Use

MAC LOP 168 crosses a mix of forested areas and previously forested harvested areas, roughly paralleling Highway 39 and CN railway tracks along the southern half of the lateral. A summary of the land use within the study area is provided in **Table 3.8**.

Table 3.8 Overview of Land Use within the MAC LOP 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 17.1 **Private**:0.8 **None**:51.2	Fraser-Fort George	N/A	Demonstration Forest Trails Recreation Site, near where the RoW crosses Highway 39 at chainage 11+50 (Government of BC 2018, OpenStreetMap 2018)	-	-	-

3.2.2 Contaminated Sites

Details of the single APEC identified through the desktop assessment along MAC LOP 168 are provided in **Table 3.9**. This medium-risk APEC is associated with a railway crossing.

Table 3.9 Summary of Areas of Potential Environmental Concern for MAC LOP 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
MAC LOP 168 (Inland Gas Upgrade Project)							
A10/C1	Railway crossing (west of Hwy 39 and north of Mischinsinlika Creek, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-site	Medium	40	NC-14

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated biphenyls
VPH - Volatile Petroleum Hydrocarbons

3.2.3 Fish and Fish Habitat

Eight FWA mapped watercourses were identified within the MAC LOP 168 study area during desktop analysis. During PFR, three of these watercourses were observed to have no identifiable stream channel. One unmapped water feature (e.g., wetland) was observed and mapped. A total of six watercourses potentially require riparian setbacks (depending on interaction with the Project). Three isolated bodies of standing water were observed along the lateral; these are not fish habitat and do not require riparian setbacks.

All the identified watercourses are within the Fraser-Fort George Regional District, which requires a 15 m horizontal setback for streams, 7.5 m setback for marshes or ponds, and a 15 m setback for lakes, unless otherwise stated (**Section 4.7.1**). It is recommended the more conservative provincial FRPA RMA setbacks are observed.

Waterbodies are summarized in **Table 3.10** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with medium potential to occur within the study area (**Table 3.11**). This species does not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.10 Summary of Waterbodies within the MAC LOP 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_MAC LTL 168_009 (Mischinsinlika Creek)	Stream - permanent	0	Yes	Yes	S1B	70	NC-14
NC_MAC LTL 168_010	Wetland	57	UKN	Yes	N/A*	N/A	NC-15
NC_MAC LTL 168_011 (Buth Creek)	Stream - permanent	0	UKN	Yes	S3	40	NC-16
NC_MAC LTL 168_012-ds	Stream - intermittent	0	UKN	Yes	S3	40	NC-16 NC-17
NC_MAC LTL 168_012-us	Stream - permanent	0	UKN	Yes	S3	40	NC-17
NC_MAC LTL 168_013	Stream - permanent	0	UKN	Yes	S3	40	NC-17
NC_MAC LTL 168_014	NSCI	0	UKN	Yes	N/A	N/A	NC-18
NC_MAC LTL 168_015	NSCI	0	UKN	Yes	N/A	N/A	NC-19
NC_MAC LTL 168_016	NSCI	0	UKN	Yes	N/A	N/A	NC-21
NC_MAC LTL 168_017	Stream - permanent	0	UKN	Yes	S4	30	NC-22
NC_MAC LTL 168_021	NCD	0	N	No	N/A	N/A	NC-17
NC_MAC LTL 168_022	NCD	0	N	No	N/A	N/A	NC-14
NC_MAC LTL 168_023	NCD	0	N	No	N/A	N/A	NC-15

0 = crosses lateral; NCD = non-classified drainage; NSCI = no stream channel identified; N/A = not applicable; UKN = Unknown
* Less than 5 ha in SBS biogeoclimatic zone, therefore have no FRAP wetland classification.

Table 3.11 Fish Species of Concern with Medium or High Potential to Occur within the MAC LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Y	-	High

3.2.4 Vegetation

The MAC LOP 168 study areas is located within the transition zone between the SBSmk and SBSwk subzones, with the large majority of the lateral within the SBSwk subzone (Meidinger et al. 1991). As described for MAC LTL 168, vegetation within the study area has been heavily impacted by logging activities and, as a result, a mosaic of forested habitats are present within the study area, including deciduous, mixed, and coniferous forest. Age classes of forest stands range from and early seral harvested areas (i.e., age class of 1) to old growth forest (i.e., class 8) (DataBC, 2018). Dominant species included common zonal species (hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch) as well as alder and willow. No approved OGMAs were identified within the study area during the desktop study; however, several stands of old growth forest (i.e., class 8) covering an area of approximately 25.6 ha are shown by the VRI within the study area (DataBC 2018). However, based on review of recent aerial imagery (Google Maps) and field data, it appears that several of these mapped stands have been logged recently.

No invasive vegetation was identified in the study area during the desktop search or PFR.

Desktop studies did not identify any plant species of concern with medium or high potential to occur within the study area. No plant species of concern have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Twenty-one at-risk ecological communities were identified as having potential to overlap with the study area (**Table 3.12**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.12 At-Risk Ecological Communities with Potential to Occur in the MAC LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Narrow-leaved cotton-grass - shore sedge	*Eriophorum angustifolium - Carex limosa*	-	-	Blue	Yes	X
Tamarack / water sedge / golden fuzzy fen moss	*Larix laricina / Carex aquatilis / Tomentypnum nitens*	-	-	Blue	Yes	X
Hybrid white spruce / hardhack / oak fern	*Picea engelmannii x glauca / Spiraea douglasii / Gymnocarpium dryopteris*	-	-	Red	Yes	X
Black spruce / skunk cabbage / peat-mosses	*Picea mariana / Lysichiton americanus / Sphagnum spp.*	-	-	Blue	Yes	X
Black spruce / buckbean / peat-mosses	*Picea mariana / Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Lodgepole pine / black huckleberry - velvet-leaved blueberry	*Pinus contorta / Vaccinium membranaceum - Vaccinium myrtilloides*	-	-	Blue	Yes	X
(Balsam poplar, black cottonwood) - spruces / red-osier dogwood	*Populus spp. (balsamifera, trichocarpa) - Picea spp. / Cornus stolonifera*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Sitka willow / Sitka sedge	*Salix sitchensis / Carex sitchensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus Deep Marsh*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X
Tufted clubrush / golden star-moss	*Trichophorum cespitosum / Campylium stellatum*	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.2.5 Wildlife

The MAC LOP 168 study area does not overlap with any IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018). No raptor nests were identified at the desktop level (WiTS 2018); however, four large, conspicuous stick nests (including one active osprey nest) were detected and described during the PFR. Three additional wildlife observations were identified, recorded, and described during the PFR (**Table 3.13**).

Table 3.13 Wildlife and Wildlife Habitat Features Observed in the MAC LOP 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 20 m from the RoW on power pole	NC-22
W002	Earthen burrow / den (unidentified) under tree root. Approximately 10 cm by 20 cm. Located on the edge of RoW	NC-19
W003	Unidentified stick nest that appeared to be inactive at the time of PFR. Located on a power pole	NC-17
W004	Western toad observation in wet area along RoW	NC-17
W005	Western toad observation in creek overflow area along RoW	NC-17
W006	Unidentified stick nest that appeared to be inactive at the time of PFR. Located approximately 10 m from the RoW on power pole	NC-13
W007	Active osprey nest. Two adults occupied the nest during PFR. Located approximately 10 m from the RoW on a power pole	NC-13

As with the MAC LTL 168 study area, wildlife habitat within the study area includes deciduous, mixed and coniferous forest patches, ranging from early seral stages (i.e., age class 1) to old growth forest (i.e., age class 8 or 9 or more than 140 years of age). Additional habitat types present include cleared RoWs that may be used by identified species of concern) as migration corridors, riparian areas and wetlands. The diversity of habitat present is suitable to support a variety of wildlife. Desktop studies identified 11 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.14**). The central mountain population of caribou has a known occurrence within the study area (DataBC 2018). This occurrence covers the range of the Kennedy Siding caribou herd and overlaps the entire study area. During desktop assessment, caribou were considered to have a low potential to occur, due to the type and condition of available habitat present within the study area (i.e., lower elevation forested habitat, largely impacted by logging activity). However, this species is considered to have a low potential to occur given the habitat present (i.e., lower elevation and largely impacted by logging activity).

No federally-designated critical habitat polygons occurred within, or overlapped, the study area (including caribou) (DataBC 2018). Similarly, there were no mapped masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.14 Wildlife of Concern with Medium or High Potential to Occur in the MAC LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Grizzly Bear	*Ursus arctos*	SC (2002)	1-SC (2018)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of “species of concern” as described in methods; however, was included in consideration of the high regional concern surrounding this species

3.3 BCF LTL 168

BCF LTL 168 is 0.5 km long and branches off the MAC LTL 168 from the BC LTL Mackenzie Tie-in Plant. The lateral alignment was assessed May 26, 2018 on foot, starting at the tie-in plant and ending at the west end located within the Mackenzie Pulp Mill (**Figure NC-05**). The lateral is situated in an industrial area and traverses through a cleared forest patch.

Reference photos were taken at the end and mid points. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.3.1 Land Use

BCF LTL 169 crosses CN railway tracks, immediately west of MAC LTL 168. Most of the lateral falls within the Mackenzie Pulp Mill property boundaries. A summary of the land use within the study area is provided in **Table 3.15**.

Table 3.15 Overview of Land Use within the BCF LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 0.3 **Private**:11.8	Fraser-Fort George	Mackenzie	-	-	-	-

3.3.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along BCF LTL 168 are provided in **Table 3.16**. Both sites are considered medium-risk.

Table 3.16 Summary of Areas of Potential Environmental Concern for Lateral BCF LTL 168

	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
BCF LTL 168 (PLR)							
B1	Pulp mill - MacKenzie Pulp Mill Corporation (1000 Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, PCBs, chlorinated and non-chlorinated phenols, VOCs, metals	Aerial imagery	On-site	Medium	250	NC-05
B2	Railway crossing (North of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	25	NC-05

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated biphenyls
VPH - Volatile Petroleum Hydrocarbons

3.3.3 Fish and Fish Habitat

No watercourses occur within the BCF LTL 168 study area, consequently no fish or fish habitat will be impacted by proposed pipeline upgrade activities.

3.3.4 Vegetation

The BCF LTL 168 study area is located within the SBSmk subzone (Meidinger et al. 1991:14). Much of the study area has been modified by industrial activity; vegetation in the Mackenzie Pulp Mill yard consists mostly of grasses and small shrubs and a patch of forest (mature exists at the east end of this short lateral. This forest patch is shown by the VRI as class 8 (i.e., old growth) lodgepole pine (DataBC 2018). No approved OGMAs or other areas of old growth were identified within the study area.

No invasive vegetation was identified in the study area during the desktop search or PFR.

Desktop studies did not identify any plant species of concern with medium or high potential to occur within the study area. No plant species of concern have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Ten at-risk ecological communities were identified as having potential to overlap with the study area (**Table 3.17**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.17 At-Risk Ecological Communities with Potential to Occur in the BCF LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush deep Marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.3.5 Wildlife

The BCF LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Given the disturbed and industrialized nature that characterizes much of the study area, habitat suitability for wildlife is considered relatively limited. No observations of wildlife or wildlife habitat features were recorded during the PFR. Nevertheless, the forested area in the eastern part of the study area (particularly the stand of old-growth lodgepole pine) is suitable for use by wildlife, including two species of concern that were identified to have medium potential to occur within the study area (**Table 3.18**).

The central mountain population of caribou (Scott caribou herd) has a known occurrence that overlaps the entire study area (DataBC 2018). During desktop assessment, caribou were considered to have a low potential to occur in consideration of the type and condition of the habitat present within the study area (i.e., lower elevation brownfield habitat largely impacted by industrial activity).

No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.18 Wildlife of Concern with Medium or High Potential to Occur in the BCF LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium

3.4 NWP LTL 168

NWP LTL 168 is 6.0 km long and roughly parallels NOW LOP 219. It is oriented in an approximately northeast to southwest direction along the northwest side of the Fraser River, with its southwest end at the Canfor Northwood Pulp Mill, where it ties into the PG3 LTL 219 (**Figures NC-24** to **NC-28**). The proposed PRS (Site #1) for this lateral is located at the northeast end of the lateral.

The PRS Site #1 (associated with the NWP LTL 168, NWP LOP 219, and PG3 LTL 219) was assessed on May 30, 2018 by vehicle via an access road off Landooz Road. The site is on cleared land, adjacent to a mature forest patch and approximately 100 m north of the Fraser River. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.4.1 Land Use

The southern portion of the NWP LTL 168 parallels CN railway tracks along the west side of Canfor Northwood Pulp Mill. North of the pulp mill, the lateral passes through a mix of forested areas and rural properties. The proposed PRS (Site #1) is in a cleared field on a private property owned by Enbridge. Much of the lateral is within the ALR, except for sections along the north and south end of the pulp mill, and a section through rural properties north of Progress Road. A summary of the land use within the study area is provided in **Table 3.19**.

Table 3.19 Overview of Land Use within the NWP LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (has)
Crown Agency: 10.1 **Crown Provincial: 5.7** **Private**:80.3 **None**:20.1	Fraser-Fort George	Prince George	Lateral passes through a Community Forest immediately northeast of the pulp mill (PGMap 2018)	79.0	26	**2:** 35.4 **4:** 15.3 **7:** 26.8 **Unk**:1.4

3.4.2 Contaminated Sites

Details of the four APECs identified through the desktop assessment along NWP LTL 168 are provided in **Table 3.20**. These sites are located on railways and other industrial sites. All four are considered medium-risk.

Table 3.20 Summary of Areas of Potential Environmental Concern for Lateral NWP LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
NWP LTL 168 (PRS)							
D1/E1	Sawmill - Canfor Prince George Sawmill (6988 Landooz Road, Prince George)	BTEX/VPH, EPH, PAHs, chlorinated and non-chlorinated phenols, metals	Site Reg (Site ID 1861)	Adjacent	Medium	2000	NC-26 to NC-28
D2	Railway crossing (north of Canfor Prince George Sawmill)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	16	NC-26
D3	Railway crossing (north of Beaver Forest Service Road, Prince George)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	30	NC-27
D4	Pulp mill - Canfor Northwood Pulp Mill (5353 Northwood Pulp Road, Prince George)	BTEX/VPH, EPH, PAHs PCBs, chlorinated and non-chlorinated phenols, VOCs, metals	Site Reg (Site ID 3342)	100 m south	Medium	50	NC-28

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated biphenyls
VPH - Volatile Petroleum Hydrocarbons

3.4.3 Fish and Fish Habitat

Seven FWA mapped watercourses were identified within the NWP LOP 219 study area during desktop analysis. Field assessment of watercourses along the lateral were not conducted as they are not expected to interact with PRS activities (PRS is the preferred activity for this lateral).

All identified watercourses are within the City of Prince George, which requires a development permit within 50 m of a fish-bearing watercourse, and 30 m “leave strips” (i.e., setbacks) for watercourses (**Section 4.8.2**). It is recommended the more conservative provincial FRPA RMA setbacks are observed on the lateral. However, the PRS Site #1 construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity.

Waterbodies are summarized in **Table 3.21** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified two fish species of concern with high potential to occur within the 500 m study area (**Table 3.22**). White sturgeon has a known occurrence within the 500 m study area (DataBC 2018). This occurrence covers the entire range of this population of white sturgeon in the Fraser River (DataBC 2018). Neither of these species has federally-designated critical habitat polygons in or overlapping with the study area.

Table 3.21 Summary of Waterbodies within the NWP LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_NWP LTL 168_001	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-24
NC_NWP LTL 168_002	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-25 NC-26
NC_NWP LTL 168_003	Wetland	0	UKN	Yes	UKN	UKN	NC-25 NC-26
NC_NWP LTL 168_004	Stream - permanent	20	UKN	Yes	UKN	UKN	NC-26
NC_NWP LTL 168_005	Stream - permanent	0	Yes	Yes	S1B	70	NC-26
NC_NWP LTL 168_006	Settling pond	7	No	Yes	N/A	N/A	NC-26
NC_NWP LTL 168_007	Stream - intermittent	0	UKN	Yes	UKN	UKN	NC-27 NC-28

0 = crosses lateral; N/A = not applicable; UKN = unknown (as PFR was not conducted)

Table 3.22 Fish Species of Concern with Medium or High Potential to Occur within the NWP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Y	-	High
White Sturgeon (Upper Fraser River population)	*Acipenser transmontanus pop. 5*	1-E (Aug 2006)	E (Nov 2012)	Red	Y	-	High

3.4.4 Vegetation

The NWP LTL 168 study area is located within the Sub-Boreal Spruce Moist Hot (SBSmh) subzones, which is found in the Fraser and Quesnel River valleys. Dominant species of this subzone include hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch (Meidinger et al. 1991). Vegetation present within the study area includes a mix of forest, fields, riparian areas and wetlands. Forested areas, as shown by the VRI, are generally dominated by deciduous species including poplar (*Populus* ssp.), trembling aspen, and paper birch, and range from age class 2 to old-growth (i.e., class 8) (DataBC 2018). The proposed location of the PRS (Site #1) is within a field dominated by grasses and common dandelion (*Taraxacum officinale*). No approved OGMAs were identified within the study area during the desktop studies; however, several stands of old growth forest covering an area of approximately 19.0 ha are mapped by the VRI within the study area (DataBC 2018). Based on review of recent aerial imagery (Google Maps) and field data, it appears that some of these stands have been cleared since the time of mapping.

No invasive vegetation was identified in the study area during the desktop search. However, two small patches of invasive vegetation were identified adjacent to the proposed location of the PRS (Site #1) (**Table 3.23** and **Figure NC-24**). These two sites covered a total area of approximately 100 m^2.

Table 3.23 Invasive Vegetation Identified within the NWP LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (provincially)
	Number of Species		2
	Number of Sites		2
	Total Area (m^2)		100

Desktop studies identified one plant species of concern (Sprengel's sedge (*Carex sprengelii*)) with medium potential to occur within the study area. No plant species of concern have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Five at-risk ecological communities were identified as having potential to overlap with the study area. (**Table 3.24**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.24 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the NWP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a particular community can be found within BEC subzones present within the study area.

3.4.5 Wildlife

The NWP LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Available wildlife habitat within the study area, includes a diversity of habitat types including a mix of young and mature (i.e., age classes 2 to 8) deciduous dominant forests, agricultural or maintained fields, wetlands, and riparian habitat. Habitats near the proposed location of the PRS (Site #1) include the field (where the PRS is situated), patches of mature forest, and riparian habitat associated with the Fraser River. The habitat types present within the study area and near the PRS (Site #1) may provide security for wildlife for movement (including migration and dispersal), foraging, nesting and breeding (e.g., amphibian breeding in wetlands) and is suitable for use by several wildlife species of concern.

Desktop studies identified nine wildlife species of concern with medium or high potential to occur within the study area (**Table 3.25**). No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during PFR at the proposed PRS location.

Table 3.25 Wildlife of Concern with Medium or High Potential to Occur in the NWP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of “species of concern” as described in methods; however, was included in consideration of the high regional concern surrounding this species.

3.5 NWP LOP 219

NWP LOP 219 is 5.8 km long, and roughly parallels the NWP LTL 168 in an approximately northeast to southwest direction along the northwest side of the Fraser River (**Figures NC-24** to **NC-28**). The southwest end of the lateral connects with PG3 LTL 219, and the northeast end is at the proposed location of PRS Site #1.

The PRS Site #1 (associated with the NWP LTL 168, NWP LOP 219, and PG3 LTL 219) was assessed on May 30, 2018 by vehicle via an access road off Landooz Road. The site is on cleared land, adjacent to a mature forest patch and approximately 100 m north of the Fraser River. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.5.1 Land Use

From its southwest end, where it connects with PG3 LTL 219, NWP LOP 219 runs along the west side of Landooz Road, to where it crosses the Canfor Pulp Mill and runs along the north side of NWP LTL 168 through a mosaic of forested areas and fields. Most of the lateral is within the ALR. A summary of the land use within the study area is provided in **Table 3.26**.

Table 3.26 Overview of Land Use within the NWP LOP 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 9.0 **Crown Provincial:**12.6 **Municipal**:0.1 **Private**:74.5 **None**:20.3	Fraser-Fort George	Prince George	Lateral passes through a Community Forest immediately northeast of the pulp mill (PGMap 2018)	100.1	24	**2:** 49.0 **4:** 22.8 **7:** 27.0 **Unk**: 1.2

3.5.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along NWP LTL 168 are provided in **Table 3.27**. Both sites are considered medium-risk.

Table 3.27 Summary of Areas of Potential Environmental Concern for Lateral NWP LOP 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
NWP LOP 219 (PRS)							
D1/E1	Sawmill - Canfor Prince George Sawmill (6988 Landooz Road, Prince George)	BTEX/VPH, EPH, PAHs, chlorinated and non-chlorinated phenols, metals	Site Reg (Site ID 1861)	15 m south, adjacent north	Medium	550	NC-26
E2	Railway crossing (north of Canfor Prince George Sawmill)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	20	NC-26

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.5.3 Fish and Fish Habitat

Seven FWA mapped watercourse were identified within the NWP LOP 219 study area during desktop analysis. Field assessment of watercourses was not conducted along the lateral, as the footprint of the PRS site is not expected to interact with any watercourses.

All identified watercourses are within the City of Prince George, which requires a permit for development within 50 m of a fish-bearing watercourse, and 30 m “leave strips” (i.e., setbacks) for watercourses (**Section 4.8.2**). It is recommended the more conservative provincial FRPA RMA setbacks are applied. However, the PRS Site #1 construction footprint does not interact with any of these watercourses; therefore, riparian setbacks would not apply to the proposed PRS activity.

Waterbodies are summarized in **Table 3.33** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified two fish species of concern with high potential to occur within the 500 m study area (**Table 3.29**). White sturgeon has a known occurrence within the 500 m study area (DataBC 2018). This occurrence covers the entire range of this population of white sturgeon in the Fraser River (DataBC 2018). Neither of these species has federally-designated critical habitat polygons in or overlapping the study area.

Table 3.28 Summary of Waterbodies within the NWP LOP 219 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_NWP LTL 168_001	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-24
NC_NWP LTL 168_002	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-25 NC-26
NC_NWP LTL 168_003	Wetland	0	UKN	Yes	UKN	UKN	NC-25 NC-26
NC_NWP LTL 168_004	Stream - permanent	20	UKN	Yes	UKN	UKN	NC-26
NC_NWP LTL 168_005	Stream - permanent	0	Yes	Yes	S1B	70	NC-26
NC_NWP LTL 168_006	Settling Pond	7	No	Yes	N/A	N/A	NC-26
NC_NWP LTL 168_007	Stream - intermittent	40	UKN	Yes	UKN	UKN	NC-27 NC-28

NSCI = no stream channel identified; NCD= Non-classified drainage; N/A = not applicable; FWA = Freshwater Atlas
1 Calculated from a Simple Assessment.

Table 3.29 Fish Species of Concern with Medium or High Potential to Occur within the NWP LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Y	-	High
White Sturgeon (Upper Fraser River population)	*Acipenser transmontanus pop. 5*	1-E (Aug 2006)	E (Nov 2012)	Red	Y	-	High

3.5.4 Vegetation

The NWP LOP 219 study area is located within the SBSmh subzone. Dominant species of this subzone include hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch (Meidinger et al. 1991). Vegetation present within the study area includes a mix of mature forest, fields, riparian areas and wetlands. Forested areas, as shown by the VRI, are generally dominated by deciduous species including poplar (*Populus* ssp.), trembling aspen, and paper birch, and range from age class 2 to old-growth (i.e., class 8) (DataBC 2018). The proposed location of the PRS (Site #1) is within a field dominated by grasses and common dandelion. No approved OGMAs were identified within the study area during the desktop studies; however, several stands of old growth forest (i.e., class 8) covering an area of approximately 19.0 ha are shown by the VRI within the study area (DataBC 2018). Based on review of recent aerial imagery (Google Maps) and field data, it appears that some of these stands have been cleared since the time of mapping.

No invasive vegetation was identified in the study area during the desktop search. However, two small patches of invasive vegetation were identified adjacent to the proposed location of the PRS (Site #1) (**Table 3.3** and **Figure NC-24**). These two sites covered a total area of approximately 100 m^2.

Table 3.30 Invasive Vegetation Identified within the NWP LOP 219 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
	Number of Species		2
	Number of Sites		2
	Total Area (m^2)		100

Desktop studies identified one plant species of concern (Sprengel's sedge) with medium potential to occur within the study area. No plant species of concern have known occurrences or federally designated critical habitat polygons within or overlapping the study area (DataBC 2018). Five at-risk ecological communities were identified as having potential to overlap with the study area (**Table 3.31**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.31 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the NWP LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.5.5 Wildlife

The NWP LOP 219 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). A mosaic of wildlife habitat is present within the study area, including a mix of young and mature (i.e., age classes 2 to 8) deciduous dominant forest stands, wetlands, and riparian areas. Habitats near the proposed location of the PRS (Site #1) include the field where the PRS is situated, patches of mature forest, and riparian habitat associated with the Fraser River. The habitat types present near the PRS (Site #1) may provide security for wildlife (including several wildlife species of concern) for movement (including migration and dispersal), foraging, nesting and breeding (i.e., amphibian breeding in wetlands).

Desktop studies identified nine wildlife species of concern with medium or high potential to occur within the study area (**Table 3.32**). No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during the visit to the proposed location of the PRS during the PFR.

Table 3.32 Wildlife of Concern with Medium or High Potential to Occur in the NWP LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of "species of concern" as described in methods; however, was included in consideration of the high regional concern surrounding this species.

3.6 PG3 LTL 219

PG3 LTL 219 is 5.3 km long and is oriented in an approximately northeast to southwest direction in northeast Prince George. The northeast end is at the Canfor Northwood Pulp Mill in (where it ties into NWP LTL 168 and NWP LOP 219) and the southwest end is near the intersection of Noranda Road East and Northwood Pulp Mill Road (**Figures NC-28** to **NC-30**). The proposed PRS (Site #1) for this lateral is located at the northeast end of the NWP LTL 168 (see **Section 3.4**).

The PRS Site #1 (associated with the NWP LTL 168, NWP LOP 219, and PG3 LTL 219) was assessed on May 30, 2018 by vehicle via an access road off Landooz Road. The site is on cleared land, adjacent to a mature forest patch and approximately 100 m north of the Fraser River. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.6.1 Land Use

Most of the study area overlaps with forested areas and rural properties, with the northeast end of the lateral located in the Canfor Northwood Pulp Mill. The northern portion of the lateral along Landooz Road is located within the ALR. A summary of the land use within the study area is provided in **Table 3.33**.

Table 3.33 Overview of Land Use within the PG3 LTL 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 1.1 **Crown Provincial**: 12.3 **Private**:88.3	Fraser-Fort George	Prince George	Lateral passes through a Community Forest / Green space near chainage 2+1 (PG Map, 2018)	28.0	9	**2:** 22.6 **7:** 5.5

3.6.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along PG3 LTL 219 are provided in **Table 3.34**.

Table 3.34 Summary of Areas of Potential Environmental Concern for Lateral PG3 LTL 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
PG3 LTL 219 (PRS)							
F1	Railway crossing (east of Landooz Road, Prince George)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-site	Medium	20	NC-28
F2	Fortis pump station - Site Registry entry noting mercury contamination (1221 Noranda Road, Prince George)	Mercury	Site Reg (Site ID 2135)	On-site	High	30	NC-30

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons

3.6.3 Fish and Fish Habitat

Four FWA mapped watercourse were identified within the PG3 LTL 219 study area during desktop analysis. Field assessment of watercourses along the lateral were not conducted as they are not expected to interact with PRS activities (PRS is the preferred activity for these laterals).

All identified watercourses are within the City of Prince George, which requires a permit for any development within 50 m of a fish bearing watercourse, and 30 m leave strips (i.e., setbacks) for watercourses (**Section 4.8.2**). It is recommended the more conservative provincial FRPA RMA setbacks are observed. However, the PRS Site #1 (located at the north end of NWP LTL 168) construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity.

Waterbodies are summarized in **Table 3.2** and biophysical descriptions are provided in **Appendix D**.

Desktop studies did not identify any fish species of concern with medium or high potential to occur within the study area.

Table 3.35 Summary of Waterbodies within the PG3 LTL 219 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_NWP LTL 168_007	Stream - intermittent	40	UKN	Yes	UKN	UKN	NC-27 NC-28
NC_PG3 LTL 219_001 (McMillan Creek)	Stream - permanent	0	Yes	Yes	UKN	UKN	NC-29 NC-30
NC_PG3 LTL 219_002	Stream - intermittent	0	UKN	Yes	UKN	UKN	NC- 30
NC_PG3 LTL 219_003	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-30

0 = crosses lateral; UKN = unknown (as PFR only covered the PRS site)

3.6.4 Vegetation

The PG3 LTL 219 study area is located within the transition zone between the SBSmh and SBSmk subzones, with the eastern-most approximately 1.5 km located in the SBSmh subzone and the westernmost 4.2 km located in the SBSmk subzone. Dominant species include hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch (Meidinger et al. 1991). Vegetation within the study area includes a mix of mature forest and cleared fields. Forested areas, as shown by the VRI, are generally dominated by deciduous species including poplar, trembling aspen, and paper birch, and range from age class 4 to 8 (DataBC 2018). The proposed location of the PRS (Site #1) is within a field dominated by grasses and common dandelion. No approved OGMAs were identified within the study area during the desktop studies; however, approximately 0.9 ha of the study area is shown by the VRI as old growth (i.e., class 8) forest.

No invasive vegetation was identified in the study area during the desktop search. Two small sites of invasive vegetation were identified adjacent to the proposed location of the PRS (Site #1) (**Table 3.36** and **Figure NC-24**). These two sites covered a total area of approximately 100 m^2.

Table 3.36 Invasive Vegetation Identified within the PG3 LTL 219 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
	Number of Species		2
	Number of Sites		2
	Total Area (m^2)		100

Desktop studies identified one plant species of concern (Sprengel's sedge) with medium potential to occur within the study area. No plant species of concern have known occurrences or federally designated critical habitat polygons within or overlapping the study area (DataBC 2018). Fifteen at-risk ecological communities were identified as having potential to overlap with the study area. (**Table 3.37**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.37 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the PG3 LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.6.5 Wildlife

The PG3 LTL 219 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Habitat within the study area included areas of mature (age classes 4 to 8) predominantly deciduous forest and adjacent fields. Habitats near the proposed location of the PRS (Site #1) at the north end of NWP LTL 168 include the field in which the PRS is located in, patches of mature forest, and riparian habitat associated with the Fraser River. The habitat types present within the study area and near the PRS (Site #1) may provide security for wildlife (including several wildlife species of concern) for movement (including migration and dispersal), foraging and nesting.

Desktop studies identified nine wildlife species of concern with medium or high potential to occur within the study area (**Table 3.38**). None of these species have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during the visit to the proposed location of the PRS during the PFR.

Table 3.38 Wildlife of Concern with Medium or High Potential to Occur in the PG3 LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium

***Note:** Northern goshawk atricapillus subspecies does not fall into the category of “species of concern” as described in methods; however, was included in consideration of the high regional concern surrounding this species.

3.7 HUS LTL 168

HUS LTL 168 is 1.1 km long and is in Prince George, BC on the north side of the Fraser River along the Prince George Pulp Mill Road **(Figures NC-31** to **NC-32**). The proposed location of the PRS station is at the south end of the lateral where it ties into the PGP LTL 168 at the PGP 129 Block Valve Station.

The HUS LTL 168 alignment was assessed on foot over two days, including May 27 and 30, 2018. The assessment followed Prince George Pulpmill Road through an industrial area, then along a CN track.

Reference photos were taken along the lateral at approximately 200 m intervals; additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.). An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.7.1 Land Use

HUS LTL 168 located between the Husky Oil Refinery and the Canfor Intercontinental Pulp Mill. The southern portion of the lateral crosses and runs along on the east side of the CN track associated with the mill, and the northern portion of the lateral is located along the north side of Prince George Pulpmill Road. The proposed location of the PRS station is located at the south end of the lateral at the PGP 129 Block Valve Station, immediately east of the CN track, and west of the Canfor Pulp Mill facilities. A summary of the land use within the study area is provided in **Table 3.39**.

Table 3.39 Overview of Land Use within the HUS LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 10.3 **Municipal**: 0.1 **Private**:10.2	Fraser-Fort George	Prince George	-	-	-	-

3.7.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along HUS LTL 168 are provided in **Table 3.40**. Of the seven sites identified, four were high-risk and three are medium-risk. These sites were primarily associated with pulp mills, railway crossings and the Husky refinery.

Table 3.40 Summary of Areas of Potential Environmental Concern for HUS LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
HUS LTL 168 (PLR)							
H2/I1	Fortis pump station - Site Registry entry noting mercury contamination (2789 Pulpmill Road, Prince George)	Mercury	Site Reg (Site ID 1329)	On-Site	High	25	NC-32
H3/I2	Pulp mill - East Canfor Pulp Mill (2533 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Ecolog (Waste Generation)	50 m east	Medium	530	NC-32
I3	Pulp mill chemical manufacturing – ChemTrade (2711 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, VOCs	Ecolog (Chemical Register)	120 m west	Medium	380	NC-32
I4	Railway crossing (north of Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	45	NC-32
I5	Husky refinery - Husky Oil Limited (Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, VOCs, metals	Site Reg (Site ID 2021 and 15416)	Adjacent	High	850	NC-32
I6	Pulp mill - West Canfor Pulp Mill (2533 Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Ecolog (Waste Generation)	200 m south / 300 m west	Medium	1300	NC-32
I7	Chemical manufacturer - Peroxychem Chemical Manufacturer (2366 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, VOCs	Site Reg (Site ID 4520)	50 m south	High	50	NC-31

Notes: APEC – Area of Potential Environmental Concern
PCOCs – Potential Contaminants of Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
EPH – Extractable Petroleum Hydrocarbons
PAHs – Polycyclic Aromatic Hydrocarbons
PCBs – Polychlorinated biphenyls
VOCs – Volatile Organic Compounds
VPH – Volatile Petroleum Hydrocarbons
Site Reg – BC ME Online Site Registry

3.7.3 Fish and Fish Habitat

One FWA mapped watercourse was identified within the HUS LTL 168 study area during desktop analysis. During PFR, watercourse HUS LTL 168_001 was confirmed to be a man-made settling pond within an industrial area and does not require a riparian setback.

Waterbodies are summarized in **Table 3.41** and biophysical descriptions are provided in **Appendix D**.

Two fish species of concern were identified as having medium or high potential to occur Fraser and Nechako Rivers, which are located within 500 the study area (**Table 3.42**). The upper Fraser River population of white sturgeon has a known occurrence within the study area (DataBC 2018). This occurrence covers the entire range of this population of white sturgeon (DataBC 2018). Neither of these species has federally-designated critical habitat polygons in or overlapping the study area.

Table 3.41 Summary of Waterbodies within the HUS LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	Setback (m)	Figure Reference
NC_HUS LTL 168_001	Settling Pond	35	No	Yes	N/A	N/A	NC-31

N/A = not applicable

Table 3.42 Fish Species of Concern with Medium or High Potential to Occur within the HUS LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	Salvelinus confluentus	-	SC (Nov 2012)	Blue	Y	-	High (in Fraser / Nechako Rivers)
White Sturgeon (Nechako River and Upper Fraser populations)	*Acipenser transmontanus pop. 3 and pop. 5*	1-E (Aug 2006)	E (Nov 2003)	Red	Y	-	High (in Nechako River)

3.7.4 Vegetation

The HUS LTL 168 study area is located within the transition zone between the SBSmh and SBSmk subzones (Meidinger et al. 1991). This area has been highly modified by industrial activity, and vegetation present was mostly limited to non-forested habitats along roadsides and the railway tracks. Vegetation in these areas mainly included grasses and early seral species such as horsetail (*Equisetum spp*.), common dandelion, thimbleberry (*Rubus parviflorus*), trembling aspen, and rose (*Rosa spp.*). One stand of mature (age class 6) mixed forest was present at the northwest end of the study area. No approved OGMAs or areas of old growth forest were identified within the study area during the desktop studies. Vegetation at the proposed location of the PRS consisted mainly of grasses and horsetail.

No invasive vegetation was identified in the study area during the desktop search. Seven sites of Canada thistle (provincially noxious species) covering an area of approximately 528 m^2 were identified during the PFR (**Figure NC-32**); one of these sites is located approximately 50 m away from the proposed location of the PRS station.

Desktop studies identified one plant species of concern (Sprengel's sedge) with medium potential to occur within the study area. One species, small-flowered lousewort (*Pedicularis parviflora*), has a known occurrence in the Prince George area that overlaps with the study area (DataBC 2018). This species is considered to have low potential to occur in the study area, as the last confirmed occurrence was recorded in 1971 and was located south of the Fraser River. Also this species is generally associated with wet meadows, fens and bogs, which were not observed within the study area (Klinkenberg 2015, DataBC 2018). No plant species of concern have federally-designated critical habitat polygons within or overlapping the study area. Fifteen at-risk ecological communities were identified as having potential to overlap with the with the study area. (**Table 3.43**). None of these ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.43 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the HUS LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.7.5 Wildlife

The HUS LTL 168 study area does not overlap with any IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018). No raptor nests were identified at the desktop level (WiTS 2018); however, one active osprey nest was recorded during the PFR on south side of Prince George Pulp Mill Road across the road from the Husky Oil 1 Customer Station (see W001, **Figure NC-32**). Habitat within the immediate vicinity of the lateral has generally been modified by industrial activity; however, the areas of mature deciduous and mixed forest northwest of the lateral and the banks of the Fraser and Nechako Rivers are suitable for use by a several species of wildlife, including wildlife species of concern.

Desktop studies identified three wildlife species of concern with medium or high potential to occur within the study area (**Table 3.44**). No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No other wildlife of concern or wildlife habitat features were recorded during the PFR, including at the location of the proposed PRS.

Table 3.44 Wildlife of Concern with Medium or High Potential to Occur in the HUS LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High

3.8 PGP LTL 168

PGP LTL 168 is 1.0 km long, and crosses the Fraser River, connecting with HUS LTL 168 at its north end at the PGP 129 Block Valve Station, and with PG1 LTL 168 at its south end at the Prince George Lateral 168 Tie-in Crossover Plant (**Figures NC-32** to **NC-33**). The proposed location of the PRS is at the south end of the lateral.

PGP LTL 168 was assessed on May 28 and 30, 2018. The north end was accessed on foot via Prince George Pulp mill and along a CN track, through an industrial area. The south end was accessed by vehicle from Pickering Road. Reference photos were taken along the lateral at approximately 200 m intervals, and at either bank of the Fraser River. Additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.). An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.8.1 Land Use

The north end of the PGP LTL 168 runs along the east side of the CN railway tracks through the Canfor Intercontinental Pulp Mill. On the south side of the Fraser River the lateral crosses the CN track and is bordered by a forested area. The proposed location of the PRS station is located in a cleared area within a forested patch between the CN railway and a cleared utility ROW. A summary of the land use within the study area is provided in **Table 3.45**.

Table 3.45 Overview of Land Use within the PGP LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 10.3 **Municipal**: 0.1 **Private**:10.2	Fraser-Fort George	Prince George	-	-	-	-

3.8.2 Contaminated Sites

Details of the three APECs identified through the desktop assessment along PGP LTL 168 are provided in **Table 3.46**. Two sites were characterized as medium-risk and one was high-risk.

Table 3.46 Summary of Areas of Potential Environmental Concern for Lateral PGP LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
PGP LTL 168 (Inland Gas Upgrade Project)							
H1	Railway crossing (south of the Fraser River)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-Site	Medium	20	NC-33
H2/I1	Fortis pump station - Site Registry entry noting mercury contamination (2789 Pulpmill Road, Prince George)	Mercury	Site Reg (Site ID 1329)	On-Site	High	30	NC-32
H3/I2	Pulp mill - East Canfor Pulp Mill (2533 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Waste Generation, Aerial Imagery	50 m east	Medium	270	NC-32

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.8.3 Fish and Fish Habitat

Two FWA mapped watercourse were identified within the PGP LTL 168 study area during desktop analysis. During PFR, watercourse PGP LTL 168_001 was confirmed to be a man-made settling pond within an industrial area and does not require a riparian setback.

PGP LTL 168 spans watercourse PGP LTL 168_002 (i.e., the Fraser River) via an aerial crossing. In the City of Prince George, a development permit is required within 50 m of a fish bearing watercourse, and a 30 m leave strip (i.e., setbacks) is required for watercourses (**Section 4.8.2**). Note: a 50 m leave strip is required along the Fraser River in areas devoid of trees and there is evidence of active bank erosion. It is recommended the more conservative provincial FRPA RMA setbacks are applied. However; no watercourses are within the PRS construction footprint; therefore, the riparian setback does not apply. Waterbodies are summarized in **Table 3.47** and biophysical descriptions are available in **Appendix D**

Two fish species of concern were identified as having medium or high potential to occur Fraser and Nechako Rivers, which are located within 500 the study area (**Table 3.48**). The upper Fraser River population of white sturgeon has a known occurrence within the study area (DataBC 2018). This occurrence covers the entire range of this population of white sturgeon (DataBC 2018). Neither of these species has federally-designated critical habitat polygons in or overlapping the study area.

Table 3.47 Summary of Waterbodies within the PGP LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
PGP LTL 168_001	Settling Pond	75	No	Yes	N/A	N/A	NC-33
PGP LTL 168_002 (Fraser River)	Stream - permanent	0	Yes	Yes	S1-A	100	NC-33

N/A = not applicable; 0 = watercourse crosses lateral

Table 3.48 Fish Species of Concern with Medium or High Potential to Occur within the PGP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	Salvelinus confluentus	-	SC (Nov 2012)	Blue	Y	-	High (in Fraser / Nechako Rivers)
White Sturgeon (Nechako River and Upper Fraser populations)	*Acipenser transmontanus pop. 3 and pop. 5*	1-E (Aug 2006)	E (Nov 2003)	Red	Y	-	High (in Nechako River)

3.8.4 Vegetation

The PGP LTL 168 study area is located within the transition zone between the SBSmh and SBSmk subzones (Meidinger et al. 1991). Except for forested areas along the banks of the Fraser River, much of the study area had been cleared or is maintained for industrial purposes. The vegetation present included grasses and early seral species such as horsetail, common dandelion, thimbleberry, trembling aspen and rose. Vegetation along the banks of the Fraser River consisted of mature, mixed forest (age classes 5 to 8) with species including lodgepole pine, poplar, and trembling aspen (DataBC 2018). No approved OGMAs were identified within the study area; however, the VRI shows a stand of old growth forest on the south side of the Fraser River, at the south end of the lateral, immediately east of the proposed location of the PRS (DataBC, 2018). Vegetation at the proposed location of the PRS consisted mainly of horsetail, grasses, and thimbleberry.

No invasive vegetation was identified in the study area during the desktop search. One site of Canada thistle (*Cirsium arvense)* (provincially noxious), which covered a total area of approximately 25 m^2 was identified during the PFR, approximately 20 m from the proposed location of the PRS (**Figure NC-33**).

Desktop studies identified one plant species of concern (Sprengel's sedge (*Carex sprengelii*)) with medium potential to occur within the study area. One species, small-flowered lousewort (*Pedicularis parviflora*), has a known occurrence in the Prince George area that overlaps with the study area (DataBC 2018). This species is considered to have low potential to occur in the study area, as the occurrence dates back to 1971, is centred around the portion of Prince George south of the Fraser River, and this species is generally associated with wet meadows, fens and bogs (Klinkenberg 2015, DataBC 2018).

No plant species of concern have federally-designated critical habitat polygons within or overlapping the study area. Fifteen at-risk ecological communities were identified to overlap with the BEC subzones in the study area. (**Table 3.49**). None of these ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.49 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the PGP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus Deep Marsh*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.

"X" indicates that a community can be found within BEC subzones present within the study area.

3.8.5 Wildlife

The PGP LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Habitat within the immediate vicinity of the lateral has generally been disturbed by industrial activity; however, the areas of mature (i.e., age classes 5 to 8) mixed forest on the banks of the Fraser River is suitable for use by several species of wildlife, including wildlife species of concern.

Desktop studies identified three wildlife species of concern with medium or high potential to occur within the study area (**Table 3.50**). No wildlife of concern or wildlife habitat features were identified during the PFR, including at the proposed location of the PRS. No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.50 Wildlife of Concern with Medium or High Potential to Occur in the PGP LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	-	Medium

3.9 PG1 LTL 168

PG1 LTL 168 is 4.7 km long, and is in eastern Prince George, east of the Fraser River. The west end of the lateral connects to PGP LTL 168 at the Prince George Lateral 168 Tie-in Crossover Plant, and the east end is in a rural area of eastern Prince George (**Figures NC-33** to **NC-36**).

PG1 LTL 168 was assessed by foot and ATV over two days (May 28 and 30, 2018). The assessment began at the Prince George Lateral 168 Tie-in Crossover Plant, with access from Pickering Road, and continued east along the lateral to Site #1 (Launcher). The lateral parallels a cleared BC Hydro ROW through mature coniferous forest, and crosses one residential road.

Photos were taken along the lateral at intervals generally less than 1000 m, additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.), areas where the land use or ecology changes, wildlife and vegetation feature locations, and at watercourses. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.9.1 Land Use

PG1 LTL 168 is located along a cleared utility corridor that crosses Highway 16 and runs through a mix of predominantly forested and rural areas. A summary of the land use within the study area is provided in Table 3.51.

Table 3.51 Overview of Land Use within the PG1 LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 1.0 **Municipal**: 13.9 **Private**:62.5 **None**:15.0 **Unknown**:0.9	Fraser-Fort George	Prince George	Lateral passes through a Community Forest / green space between approximate chainages 3+0 and 3+9 (PGMap 2018)	22.8	5	**4**: 22.8

3.9.2 Contaminated Sites

Details of the one medium-risk APEC identified through the desktop assessment along PG1 LTL 168 are provided in **Table 3.52**.

Table 3.52 Summary of Areas of Potential Environmental Concern for Lateral PG1 LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
PG1 LTL 168 (Inland Gas Upgrade Project)							
G1	Race track - Pgara Speedway (3645 Highway 16 W, Prince George)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Field visit, aerial imagery	Adjacent	Medium	300	NC-34

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds

3.9.3 Fish and Fish Habitat

Two FWA mapped watercourse were identified within the PG1 LTL 168 study area during desktop analysis. Both watercourses were confirmed present during the PFR. At the time of assessment, watercourse PG1 LTL 168_001 was under construction; water had been diverted (i.e., the watercourse as dry) while culverts and riprap were being placed. Watercourse PG1 LTL 168_002 was heavily impacted by beaver activity, resulting in a heavily braided channel (approximately 60 m wide). The second was an isolated body of standing water observed along the existing alignment, which is not fish habitat and does not require a riparian setback.

Both watercourses are within the City of Prince George, which requires a permit for development within 50 m of a fish-bearing watercourse, and 30 m leave strips (i.e., setbacks) for watercourses (**Section 4.8.2**). It is recommended the more conservative provincial FRPA RMA setbacks are utilized.

Waterbodies are summarized in **Table 3.53** and biophysical descriptions are provided in **Appendix D**.

Two fish species of concern were identified as having medium or high potential to occur Fraser and Nechako Rivers, which are located within 500 the study area (Table 3.54). The upper Fraser River population of white sturgeon has a known occurrence within the study area (DataBC 2018). This occurrence covers the entire range of this population of white sturgeon (DataBC 2018). Neither of these species has federally-designated critical habitat polygons in or overlapping the study area.

Table 3.53 Summary of Waterbodies within the PG1 LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_PG1 LTL 168_001	Stream - permanent*	0	UKN	Yes	S2	50	NC-34
NC_PG1 LTL 168_002 (Bittner Creek)	Stream - permanent	0	Yes	Yes	S1B	70	NC-36
NC_PG1 LTL 168_003	NCD	0	N	No	N/A	N/A	NC-36

NCD = non-classified drainage; UKN = unknown

* Watercourse under construction at time of PFR. Water had been diverted; culverts and riprap were being placed.

Table 3.54 Fish Species of Concern with Medium or High Potential to Occur within the PG1 LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	Salvelinus confluentus	-	SC (Nov 2012)	Blue	Y	-	High (in Fraser / Nechako Rivers)
White Sturgeon (Nechako River and Upper Fraser populations)	*Acipenser transmontanus pop. 3 and pop. 5*	1-E (Aug 2006)	E (Nov 2003)	Red	Y	-	High (in Nechako River)

3.9.4 Vegetation

The PG1 LTL 168 study area is located within the transition zone between the SBSmk and SBSmh subzones (Meidinger et al. 1991), with most of the study area situated in the SBSmk subzone. The lateral is located within a cleared utility RoW with mature forest on either side over most of its length. Vegetation within the utility RoW was dominated by grasses and early seral plants and shrubs including horsetail, fireweed, common dandelion, rose, thimbleberry, trembling aspen, and willow. Vegetation on either side of the RoW was mixed and coniferous forest dominated by trembling aspen and lodgepole pine, ranging in age class 2 to 8 (DataBC 2018). No approved OGMAs were identified within the study area during the desktop studies; however, two patches of old growth (i.e., class 8) forest are shown by the VRI that overlap with approximately 3.7 ha of the study area.

Approximately 6 m² of invasive vegetation (comprised of six species distributed over two sites) were identified in the study area during the desktop search. An additional six sites of Canada thistle (covering approximately 500 m^2) were identified during the PFR (**Table 3.55** and **Figures NC-33 to NC-35**).

Table 3.55 Invasive Vegetation Identified within the PG1 LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hawkweed species	*Hieracium spp.*	HS	Noxious (Regionally)
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
	Number of Species		6
	Number of Sites		8
	Total Area (m^2)		506

Desktop studies identified two plant species of concern with medium potential to occur within the study area. One species, small-flowered lousewort, has a known occurrence that overlaps with the study area (DataBC 2018). The wetted area associated with NC_PG1 LTL 168_002 (Bittner Creek) provides suitable habitat for this species; however, it was not observed during PFR. No plant species of concern have federally designated critical habitat polygons within or overlapping the study area. Fifteen at-risk ecological communities were identified as having potential to overlap with the study area (**Table 3.56**). None of these ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.56 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the PG1 LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Small-flowered lousewort	*Pedicularis parviflora*	-	-	Red	Yes	Medium
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus Deep Marsh*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.9.5 Wildlife

The PG1 LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). The habitat present within the study area includes areas of young and mature mixed and coniferous forest (i.e., age classes 2 to 8), cleared RoWs, and riparian habitat associated with the Fraser River. These habitat types may provide secure movement (including migration and dispersal), foraging and nesting habitat for wildlife.

The habitat available within the study area is suitable for use by several wildlife species of concern. Desktop studies identified eight wildlife species of concern with medium or high potential to occur within the study area (**Table 3.57**). No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

During PFR, the field crew encountered construction workers on site that reported an active black bear den located south of the lateral near chainage 3+25 (approximate location shown at W001, **Figure NC-34**). The exact location of this den could not be confirmed in the field for safety reasons. No other wildlife of concern or wildlife habitat features were identified during PFR.

Table 3.57 Wildlife of Concern with Medium or High Potential to Occur in the PG1 LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Northern Myotis	*Myotis septentrionalis*	1-E (Dec 2014)	E (Nov 2013)	Blue	-	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	-	Medium

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of "species of concern" as described in methods; however, was included in consideration of the high regional concern surrounding this species

3.10 PG2 219 168

PG2 219 168 is 8.7 km long and is oriented in an approximately east to west direction in southeast Prince George. The proposed location of the PRS (Site #2) is located at the east end of the lateral (**Figures NC-37** to **NC-41**).

The PRS Site #2 was assessed on May 28, 2018 by vehicle via Johnson Road, which parallels much of the lateral. The site is adjacent to cleared agricultural land within the ALR. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.10.1 Land Use

The majority of PG2 219 168 passes through a mix of rural and urban properties, with the west end located in an industrial and commercial area on the west side of Highway 97. Most of the lateral is situated within an ALR. The proposed location of the PRS (Site #2) is in a cleared agricultural field on the south side of Johnson Road. A summary of the land use within the study area is provided in **Table 3.58**.

Table 3.58 Overview of Land Use within the PG2 219 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Federal:19.8 **Crown Provincial**:11.5 **Municipal**: 2.8 **Private**:117.8	Fraser-Fort George	Prince George	-	149.0	9	**4:** 139.1 **Unk:** 9.9

3.10.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along PG2 219 168 are provided in **Table 3.59**.

Table 3.59 Summary of Areas of Potential Environmental Concern for Lateral PG2 219 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
PG2 219 168 (PRS)							
J1	Industrial vehicle repair - James Wester Star Sterling (5239 Continental Way, Prince George)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Site Reg (Site ID 14281)	Adjacent south, 5 m east	Medium	260	NC-37
J2	Industrial Vehicle and Equipment Repair - Flacon Equipment (4943 Continental Way, Prince George)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Ecolog (Waste Generation)	Adjacent north	Low	25	NC-37

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.10.3 Fish and Fish Habitat

Nine FWA mapped watercourse were identified within the PG2 219 168 study area during desktop analysis. Field assessment of watercourses along the lateral were not conducted as they are not expected to interact with PRS activities.

Watercourses NC_PG2 219 168_001 to NC_PG2 219 168_003 are within the City of Prince George, which requires a development permit within 50 m of a fish bearing watercourse, and 30 m “leave strips” (i.e., setbacks) for watercourses (**Section 4.8.2**). The remaining six watercourses are within the Fraser-Fort George Regional District, which requires a 15 m horizontal setback (**Section 4.7.1**). It is recommended the more conservative provincial FRPA RMA setbacks are used for these watercourses. However; no watercourses are within the PRS Site #2 construction footprint; therefore, the riparian setback does not apply.

Waterbodies are summarized in **Table 3.60** and biophysical descriptions are provided in **Appendix D**.

Desktop studies did not identify any fish species of concern with medium or high potential to occur within the study area.

Table 3.60 Summary of Waterbodies within the PG2 219 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_PG2 219 168_001	Stream - intermittent	7	UKN	Yes	UKN	UKN	NC-37
NC_PG2 219 168_002 (Zogas Creek)	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-38
NC_PG2 219 168_003	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-38
NC_PG2 219 168_004 (Ellacott Creek)	Stream - intermittent	0	UKN	Yes	UKN	UKN	NC-39
NC_PG2 219 168_005	Stream - intermittent	0	UKN	Yes	UKN	UKN	NC-40
NC_PG2 219 168_006	Stream - intermittent	0	UKN	No	UKN	UKN	NC-40
NC_PG2 219 168_007	Stream - intermittent	0	UKN	No	UKN	UKN	NC-40
NC_PG2 219 168_008	Stream - intermittent	0	UKN	No	UKN	UKN	NC-40
NC_PG2 219 168_009	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-40 NC-41

UKN = unknown; 0 = watercourse crosses lateral

3.10.4 Vegetation

The PG2 219 168 study area is located within the transition zone between the SBSmk and SBSmh subzones (Meidinger et al. 1991), with most of the study area located in the SBSmk subzone. Dominant species of this subzone include hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch (Meidinger et al. 1991). Vegetation within the study area includes a mix of cleared fields and young and mature (ranging from age class 3 to 8) mixed and coniferous forests that are characterized by the VRI as being dominated by trembling aspen, white spruce and lodgepole pine (DataBC 2018). The site of the proposed PRS (Site #2) is in an agricultural field. No approved OGMAs were identified within the study area during the desktop studies; however, mature forest is present in the western part of the study area, including approximately 15.3 ha characterized as old growth (i.e., class 8) by the VRI (DataBC 2018).

Approximately 47 m² of invasive vegetation (comprised of 16 species and distributed over 15 sites) were identified in the study area during the desktop search (see **Table 3.61**). No additional invasive plants were identified during the PFR.

Table 3.61 Invasive Vegetation Identified within the PG2 219 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Curled dock	*Rumex crispus*	CD	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Chicory	*Cichorium intybus*	CY	Invasive
Green foxtail / green bristlegrass	*Setaria viridis*	GF	Noxious (Regionally)
Hawkweed species	*Hieracium spp.*	HS	Noxious (Regionally)
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
Perennial sow thistle	*Sonchus arvensis*	PS	Noxious (Provincially)
Scentless chamomile	*Matricaria perforata*	SH	Noxious (Provincially)
St. John's wort/Saint John's wort/ Goatweed	*Hypericum perforatum*	SJ	Invasive
Sowthistle species	*Sonchus species*	SO	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		16
	Number of Sites		15
	Total Area (m^2)		47

Desktop studies identified one plant species of concern (Sprengel's sedge (*Carex sprengelii*)) with medium potential to occur within the study area. No plant species of concern have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Fifteen at-risk ecological communities were identified as having potential to overlap with the study area. (**Table 3.62**). None of these at-risk ecological communities have known occurrences within the study area (DataBC 2018).

Table 3.62 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the PG2 219 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Mountain alder / red-osier dogwood / lady fern	*Alnus incana / Cornus stolonifera / Athyrium filix-femina*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Shore sedge - buckbean / hook-mosses	*Carex limosa - Menyanthes trifoliata / Drepanocladus spp.*	-	-	Blue	Yes	X
Shore sedge - buckbean / peat-mosses	*Carex limosa - Menyanthes trifoliata / Sphagnum spp.*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Lodgepole pine / black huckleberry / reindeer lichens	*Pinus contorta / Vaccinium membranaceum / Cladina spp.*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / knight's plume	*Pseudotsuga menziesii - Picea engelmannii x glauca / Ptilium crista-castrensis*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Hudson Bay clubrush / rusty hook-moss	*Trichophorum alpinum / Scorpidium revolvens*	-	-	Red	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.10.5 Wildlife

The PG2 219 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Habitat within the study area is comprised mainly of areas young to mature (age classes 3 to 8) mixed and coniferous forest, and agricultural fields. These habitat types may provide secure foraging and nesting habitat for wildlife, including several wildlife species of concern.

Desktop studies identified six wildlife species of concern with medium or high potential to occur within the study area (**Table 3.63**). None of these species have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during the visit to the proposed location of the PRS (Site #2), which is in an area surrounded by ALR land.

Table 3.63 Wildlife of Concern with Medium or High Potential to Occur in the PG2 219 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of "species of concern" as described in methods; however, was included in consideration of the high regional concern surrounding this species.

3.11 CAR LTL 168

CAR LTL 168 is 1.3 km long and is oriented in an east to west direction in Quesnel, south of the Quesnel River. The proposed location of the PRS (Site #3) is located at the east end of the lateral, approximately 100 m southwest of the Quesnel River (**Figure NC-42**).

The east end of the lateral was assessed using ATVs on May 29, 2018. At the time of the PFR, the preferred option was thought to be PRS, thus the majority of the lateral was assessed by desktop studies. The site is adjacent to the Quesnel River on cleared land surrounded by mature coniferous forest. An overview of the environmental receptors identified within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.11.1 Land Use

CAR LTL 168 is located within an industrial area in Quesnel, BC, and is aligned through a mix of forested and cleared land east of the Cariboo Pulp and Paper Mill and north of United Concrete and Gravel. The proposed location of the PRS (Site #3) is in a cleared area on the south bank of the Quesnel River. A summary of the land use within the study area is provided in **Table 3.64**.

Table 3.64 Overview of Land Use within the CAR LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Private:19.5 **None**:3.6 **Unknown**:6.5	Cariboo	Quesnel	-	-	-	

3.11.2 Contaminated Sites

Details of the single APEC identified through the desktop assessment along CAR LTL 168 is provided in **Table 3.65**.

Table 3.65 Summary of Areas of Potential Environmental Concern for Lateral CAR LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
CAR LTL 168 (PRS)							
K1	Pulp Mill - Cariboo Pulp and Paper Company (50 N Star Road, Quesnel)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Site Reg (Site ID 5296)	On-site	Medium	100	NC-42

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated biphenyls
VOCs – Volatile Organic Compounds

3.11.3 Fish and Fish Habitat

No watercourses were identified during by desktop studies within the CAR LTL 168 study area, including the east end of the lateral that was visited during PRF. Consequently no fish or fish habitat is anticipated to be impacted by pipeline upgrade activities.

Desktop studies identified two fish species of concern, bull trout and white sturgeon (Upper Fraser River) with medium and high potential to in the 500 m study area (**Table 3.66**). Neither of these species have known occurrences or federally-designated critical habitat polygons within or overlapping the study area.

Table 3.66 Fish Species of Concern with Medium or High Potential to Occur within the CAR LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Y	-	Medium (in Quesnel River)
White Sturgeon (Middle Fraser River population)	*Acipenser transmontanus pop. 3*	1-E (Aug 2006)	E (Nov 2012)	Red	Y	-	High (in Quesnel River)

3.11.4 Vegetation

The CAR LTL 168 study area is located within the SBSmh subzone. Dominant vegetation species in this subzone include hybrid white spruce, subalpine fir, lodgepole pine, trembling aspen, and paper birch (Meidinger et al. 1991). Much of the vegetation in the study area has been cleared, but a forest patch (characterized by the VRI as being dominated by Douglas-fir) is present south of the lateral and at the east end along the banks of the Quesnel River. The proposed location of the PRS (Site #3) is located at the edge of a grassy clearing. No approved OGMAs were identified within the study area during the desktop studies; however, mature forest is present in the eastern part of the study area, including approximately 6.9 ha characterized as old growth (i.e., class 8) by the VRI (DataBC 2018).

Approximately 12 m² of invasive vegetation (comprised of four species and distributed over four sites) were identified in the study area during the desktop search. An additional two sites were identified near the east end of the lateral during PFR (**Table 3.67** and **Figure NC-42**).

Table 3.67 Invasive Vegetation Identified within the CAR LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
	Number of Species		4
	Number of Sites		6
	Total Area (m^2)		88

At-risk plants and plant communities may occur within the study area. Desktop studies identified one plant species of concern (Sprengel's sedge) with medium potential to occur within the study area. This species has a known occurrence that overlaps the entire study area. No plant species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Five at-risk ecological communities were identified to have potential to occur in the study area; although, none have known occurrences within the study area.

Table 3.68 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CAR LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Hybrid white spruce - paper birch / devil's club	*Picea engelmannii x glauca - Betula papyrifera / Oplopanax horridus*	-	-	Blue	Yes	X
Hybrid white spruce / ostrich fern	*Picea engelmannii x glauca / Matteuccia struthiopteris*	-	-	Red	Yes	X
Douglas-fir / Douglas maple / step moss	*Pseudotsuga menziesii / Acer glabrum / Hylocomium splendens*	-	-	Red	Yes	X
Douglas-fir - hybrid white spruce / thimbleberry	*Pseudotsuga menziesii - Picea engelmannii x glauca / Rubus parviflorus*	-	-	Blue	Yes	X
Douglas-fir - lodgepole pine / clad lichens	*Pseudotsuga menziesii - Pinus contorta / Cladonia spp.*	-	-	Blue	Yes	X

***Notes:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.11.5 Wildlife

The CAR LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Habitat within the immediate vicinity of the lateral has generally been modified by industrial activity, however, the areas with mature (age classes 5 to 8) Douglas-fir (on the south and west sides of the lateral) may provide secure nesting habitat for wildlife and is suitable for use by a variety of wildlife, including wildlife species of concern.

Desktop studies identified five wildlife species of concern with medium or high potential to occur within the study area (**Table 3.69**). None of these species have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded in the area at the east end of the lateral visited during PFR.

Table 3.69 Wildlife of Concern with Medium or High Potential to Occur in the CAR LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	-	Medium

3.12 WIL LP1 168 and WIL LP2 168

For the purposes of this report, these two laterals have been assessed together as one study area. The WIL LP1 168 and WIL LP2 168 are 3.4 and 2.5 km long, respectively. Both laterals are oriented in a northeast to southwest direction, near the Williams Lake Airport (**Figures NC-43** to **NC-46**). The proposed PRS (Site #4) for both laterals is located at the northeast end of WIL LP2 168.

The PRS Site #4 was assessed on May 29, 2018 with vehicle access from a forestry road. The site is within a conifer forest stand dominated by dead or dying trees. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.12.1 Land Use

The WIL LP1 168 passes through a rural area with patches of forest and agricultural fields, with its east end just west of the Williams Lake Airport. The WIL LP2 168 lateral crosses the Williams Lake Airport, and a forested area east of the airport. Both laterals overlap with ALR on either side of the Williams Lake Airport. The proposed location of the PRS (Site #4) is at the northeast end of WIL LP2 168, in a forested patch immediately adjacent to a cleared utility corridor. A summary of the land use within the study area is provided in **Table 3.70**.

Table 3.70 Overview of Land Use within the WIL LP1 168 and WIL LP2 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Municipal: 14.1 **Private**:50.4 **None**:49.3	Cariboo	Williams Lake (in vicinity of airport only)	-	76.3	9	**4**: 73.7 **7**: 2.6

3.12.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along WIL LP1 168 and WIL LP2 168 are provided in **Table 3.71** and **Table 3.72**. There were no APECs in WIL LP1 168 and one medium-risk site associated with WIL LP2 168.

Table 3.71 Summary of Areas of Potential Environmental Concern for Lateral WIL LP1 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
WIL LP1 168 (PRS)							
No APECs Identified							

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

Table 3.72 Summary of Areas of Potential Environmental Concern for Lateral WIL LP2 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
WIL LP2 168 (PRS)							
L1	Hangar and maintenance area - Williams Lake Airport (3020 Airport Road, Williams Lake)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Aerial Imagery	On-Site	Medium	622	NC-44

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons

3.12.3 Fish and Fish Habitat

Seven FWA mapped watercourses were identified in the WIL LP1 168 study area and one in the WIL LP2 168 study area during desktop analysis. Field assessment of watercourses along these laterals was not conducted as they are not expected to interact with PRS activities.

The Caribou Regional District does not have riparian setback bylaws (**Section 4.7.1**); therefore, FRPA applies. However, no watercourses overlap with the PRS Site #4 construction footprint, so no RMAs are anticipated.

Waterbodies are summarized in **Table 3.73** and biophysical descriptions are provided in **Appendix D.**

Desktop studies did not identify any fish species of concern with medium or high potential to occur within the study area.

Table 3.73 Summary of Waterbodies within the WIL LP1 168 and WIL LP2 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
NC_WIL LP1 168_001	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-45
NC_WIL LP1 168_002	Stream - permanent	50	UKN	Yes	UKN	UKN	NC-45
NC_WIL LP1 168_003	Stream - permanent	35	UKN	Yes	UKN	UKN	NC-45
NC_WIL LP1 168_004	Lake	50	UKN	Yes	L3	30	NC-46
NC_WIL LP1 168_005	Wetland	100	UKN	Yes	N/A*	N/A	NC-46
NC_WIL LP1 168_006	Wetland	30	UKN	Yes	N/A*	N/A	NC-46
NC_WIL LP1 168_007	Wetland	60	UKN	Yes	N/A*	N/A	NC-46
NC_WIL LP2 168_001	Stream - permanent	0	UKN	Yes	UKN	UKN	NC-43

0 = watercourse crosses lateral; N/A = not applicable; UKN = unknown

*Less than 0.5 ha in IDF dk biogeoclimatic zone, therefore has no FRAP wetland classification.

3.12.4 Vegetation

The WIL LP1 168 and WIL LP2 168 study area is located within the transition zone between the Interior Douglas-fir Dry Cool (IDFdk) and Very Dry Mild (IDFxm) subzones (Hope, Mitchell, et al. 1991), with most of the lateral in the IDFdk subzone. These subzones are found in lower to middle elevations in the Interior Plateau, and in lower elevations of the Fraser and Chilcotin River valleys, respectively. The natural state of both of these subzones is often composed of mature forest dominated by Douglas-fir (Hope et al. 1991). Vegetation within the study area consists mainly of agricultural fields in the southwestern part of the lateral, and forested patches in the northeastern portion of the lateral. The VRI data indicates that forest within the study area is dominated primarily by Douglas-fir and lodgepole pine, with stands ranging in age classes from 1 to 7 (DataBC, 2018). Vegetation at and near the proposed location of the PRS (Site #4) was a stand of Douglas-fir that had been damaged by fire, most likely a result of the wildfire that occurred in the area in 2017 (CBC News 2017). An approved OGMA, immediately southwest of the Williams Lake Airport, overlaps both the study area of both the WIL LP1 168 and WIL LP2 168. This OGMA does not overlap with any of the anticipated construction areas for the ILI upgrade option. No other areas of old growth forest were identified within the study area during the desktop studies.

Approximately 19 m² of invasive vegetation (comprised of six species and distributed over ten sites) were identified in the study area during the desktop search. One additional site of tall hawkweed (*Hieracium piloselloides)*, which covered approximately 6,000 m², was identified in the cleared RoW near the proposed location of the PRS (Site #4) during the PFR (see **Table 3.74** and **Figure NC-43**).

Table 3.74 Invasive Vegetation Identified within the WIL LP1 168 and WIL LP2 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Hawkweed species	*Hieracium spp.*	HS	Noxious (Regionally)
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
	Number of Species		7
	Number of Sites		11
	Total Area (m^2)		6,019

Desktop studies identified one plant species of concern (Sprengel's sedge (*Carex sprengelii*)) with medium potential to occur within the study area. No plant species of concern have known occurrences or federally designated critical habitat polygons within or overlapping the study area (DataBC 2018). Thirty-seven at-risk ecological communities were identified that may occur within the study area. None of these at-risk ecological communities have known occurrences in the study area (DataBC 2018).

Table 3.75 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the WIL LP1 168 and WIL LP2 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular plants						
Sprengel's sedge	*Carex sprengelii*	-	-	Red	Yes	Medium
Ecological communities						
Spreading needlegrass Herbaceous Vegetation	*Achnatherum richardsonii Herbaceous Vegetation*	-	-	Blue	Yes	X
Northern wormwood / short-awned porcupine grass	*Artemisia campestris - Hesperostipa curtiseta*	-	-	Blue	Yes	X
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Seacoast bulrush Alkali Marsh	*Bolboschoenus maritimus var. paludosus Alkali Marsh*	-	-	Red	Yes	X
Awned sedge Fen - Marsh	*Carex atherodes Fen - Marsh*	-	-	Red	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass - Nuttall's alkaligrass	*Distichlis spicata var. stricta - Puccinellia nuttalliana*	-	-	Red	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Common spike-rush Herbaceous Vegetation	*Eleocharis palustris Herbaceous Vegetation*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia spp.*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Buckbean - slender sedge	*Menyanthes trifoliata - Carex lasiocarpa*	-	-	Blue	Yes	X
Hybrid white spruce / red-stemmed feathermoss - ragged-mosses	*Picea engelmannii x glauca / Pleurozium schreberi - Brachythecium spp.*	-	-	Blue	Yes	X
Hybrid white spruce / prickly rose / palmate coltsfoot	*Picea engelmannii x glauca / Rosa acicularis / Petasites frigidus var. palmatus*	-	-	Blue	Yes	X
Trembling aspen / spreading needlegrass - old man's whiskers	*Populus tremuloides / Achnatherum richardsonii - Geum triflorum*	-	-	Red	Yes	X
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / common juniper / clad lichens	*Pseudotsuga menziesii / Juniperus communis / Cladonia spp.*	-	-	Blue	Yes	X
Douglas-fir / Rocky Mountain juniper / kinnikinnick	*Pseudotsuga menziesii / Juniperus scopulorum / Arctostaphylos uva-ursi*	-	-	Red	Yes	X
Douglas-fir / Rocky Mountain juniper / prairie sagewort	*Pseudotsuga menziesii / Juniperus scopulorum / Artemisia frigida*	-	-	Blue	Yes	X
Douglas-fir / Rocky Mountain juniper / shrubby penstemon	*Pseudotsuga menziesii / Juniperus scopulorum / Penstemon fruticosus*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / red-stemmed feathermoss - step moss	*Pseudotsuga menziesii / Pleurozium schreberi - Hylocomium splendens*	-	-	Blue	Yes	X
Douglas-fir / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir / prickly rose / wild sarsaparilla	*Pseudotsuga menziesii / Rosa acicularis / Aralia nudicaulis*	-	-	Red	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Maccalla's willow / beaked sedge	*Salix maccalliana / Carex utriculata*	-	-	Blue	Yes	X
Tall willows / Sartwell's sedge	*Salix spp. / Carex sartwellii*	-	-	Blue	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Long-awned three-square bulrush Alkali Marsh	*Schoenoplectus pungens var. longispicatus Alkali Marsh*	-	-	Red	Yes	X
Western redcedar - hybrid white spruce / black twinberry / soft-leaved sedge	*Thuja plicata - Picea engelmannii x glauca / Lonicera involucrata / Carex disperma*	-	-	Red	Yes	X
Seaside arrow-grass marsh	*Triglochin maritima*	-	-	Red	Yes	X

***Note:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.12.5 Wildlife

The WIL LP1 168 and WIL LP2 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). No observations of wildlife or wildlife habitat features were recorded during the visit to the proposed location of the PRS (Site #4). A diversity of habitat types occurred within the remainder of the study area including areas of young and mature (age classes 1 to 7) mixed and coniferous forest, agricultural fields, cleared RoWs, lakes and wetlands. These habitat types may provide secure areas for movement (including migration and dispersal), foraging, nesting and breeding for wildlife, including several wildlife species of concern.

Desktop studies identified ten wildlife species of concern with medium or high potential to occur within the study area (**Table 3.76**). None of these species have known occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no instances of masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.76 Wildlife of Concern with Medium or High Potential to Occur in the WIL LP1 168 and WIL LP2 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Moose	*Alces americanus*	-	-	Yellow	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	Medium
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Northern goshawk *atricapillus* subspecies*	*Accipiter gentilis atricapillus*	-	NAR	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	Medium
Reptiles / Turtles							
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta* pop. 2	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	Medium

***Note:** Northern goshawk *atricapillus* subspecies does not fall into the category of “species of concern” as described in methods; however, was included in consideration of the high regional concern surrounding this species**.**

4.0 REGULATORY OVERVIEW

This section provides an overview of the environmental legislation, regulations, and bylaws that apply to the Project. A list of environmental permits and approvals that are expected to be required for each lateral is provided in the Project Risk Assessment section for each lateral (**Section 5.0**).

4.1 Federal Legislation

4.1.1 Fisheries Act

Section 35 of the *Fisheries Act* (2012) requires that "*no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery*". Serious harm is defined in the *Act* as, "*the death of fish or any permanent alteration to, or destruction of, fish habitat*". Projects "*can proceed only if there is a low likelihood and low uncertainty regarding both the death of fish and a net negative residual impact on* [fish] *habitat, prior to considerations of any offsetting activities*" (DFO 2014). Proponents must avoid or mitigate serious harm to fish. If serious harm cannot be avoided or mitigated, the Project would require an authorization under sub-Section 35(2) of the *Fisheries Act*. Other sections of the *Fisheries Act* that are applicable to the Project include Section 36(3) that prohibits the deposition of deleterious substances to waters frequented by fish, and Sections 38(4) and 38(5) that require a contravention of either Sections 35 or 36(3) be reported without delay.

4.1.2 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (SC 1994, c.22) protects various species of migratory birds including gamebirds, insectivorous birds, and non-gamebirds. This Act restricts the possession of live and dead migratory birds and bird parts and prohibits the taking of migratory bird nests and the deposit of harmful substances in waters or areas frequented by migratory birds. The provincial *Wildlife Act* described in **Section 4.3** encompasses most bird species not covered under the *MBCA*.

4.1.3 Species at Risk Act

The primary objective of the *Species at Risk Act* (SC 2002, c. 29) is to prevent species at risk from becoming extirpated or extinct, and to ensures appropriate management of species of special concern to prevent them from becoming threatened or endangered (Government of Canada 2002). Under SARA, protection is afforded to individuals, residences, and in some cases federally-designated critical habitat of species listed in Schedule 1 as "endangered", "threatened" or "extirpated". Several of the study areas for the Project alignments have federally-designated critical habitat identified within them; further details are provided in the Overview of Existing Environment sections for each alignment (**Section 3.0**).

Section 73 permits are required by anyone conducting activities that may violate SARA prohibitions by intentionally or inadvertently killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling or trading of individuals of endangered, threatened and extirpated species listed in Schedule 1 of the Act. The Act also contains a prohibition against the damage or destruction of residences (e.g., nest or den) of species listed on Schedule 1 of SARA. The Species at Risk Public Registry (Government of Canada 2018) outlines that Section 73 permits would be required where a violation to the prohibitions of SARA are anticipated for listed species that are:

- Found on federal lands in a province, or on lands in a territory under the authority of the Minister of the Environment or of the Parks Canada Agency

- Migratory birds protected by the MBCA, anywhere they occur, including private lands, lands in a province and lands in a territory
- Aquatic species anywhere they occur, including private lands, lands in a province and lands in a territory

SARA (Section 58) also contains a prohibition against destroying any part of the critical habitat of any listed endangered or threatened species, or of any listed extirpated species if a recovery strategy has recommended its reintroduction, if the:

- Critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada
- Listed species is an aquatic species
- Listed species is a species of migratory birds protected by the MBCA

4.2 Provincial Legislation (British Columbia)

4.2.1 Oil and Gas Activities Act

The BC *Oil and Gas Activities Act* (SBC 2008, c. 36) (OGAA) sets out a regulatory framework under which the Oil and Gas Commission (OGC) governs oil and gas activities within the province. The OGAA was brought into effect to consolidate and modernize the requirements that previously existed for oil and gas projects under several acts and regulations. Section 8 of the OGAA gives the Oil and Gas Commission power to make decisions under several pieces of other provincial legislation instead of the statutory decision maker with the mandate to implement that legislation. Under existing legislation, which consists of the OGAA itself and several regulations passed under the Act, the OGC has an established structure for the protection of environmental resources, and a range of compliance and enforcement abilities.

The Environmental Protection and Management Regulation (EPMR), which applies to surface Crown land, provides the OGC with the authority to manage and protect environmental values on provincial Crown land. Key environmental values that require management and protection are identified as Government's Environmental Objectives under Part 2 of the EPMR.

4.2.2 BC Environmental Management Act

The BC *Environmental Management Act* (SBC 2003, c. 53) provides requirements for the regulation of activities that introduce waste into the environment, store special waste, and treat or recycle special waste. This Act establishes the Contaminated Site Regulation (CSR), Hazardous Waste Regulation (Government of BC 1988), Clean Air Provision, the Spill Reporting Regulation (Government of BC 1990), and the Oil and Gas Waste Regulation (Government of BC 2005) and provides a permitting system to enable the authorized disposal of solid waste (including soil), discharge of emissions, and discharge of waste water (including hydrostatic test water), and surface run-off.

Part 8 of the CSR (including the most recent amendments to the EMA under B.C. Reg. 196/2017, October 31, 2017) identifies the requirements for contaminated soil relocation when considering the receiving site. If the industrial use standards, or applicable standards of the receiving site are exceeded, the soil is considered contaminated and a Contaminated Soil Relocation Agreement or disposal at a permitted facility will be required. As such, if suspect contaminated soil is encountered during trenching / construction and needs to be removed from site (e.g., for geotechnical reasons), characterization will be required to ensure relocation is completed appropriately.

4.2.3 Land Act

The *Land Act,* RSBC 1996 c. 245) is the primary legislation used by government to permit the use of Crown land by communities, industry and businesses. The Act allows the granting of land, and the issuance of Crown land tenure in the form of leases, licences, permits and rights-of-way.

Section 8 of the OGAA allows the OGC to administer the following sections of the Land Act; Section 11 (disposing of Crown land), Section 14 (temporary occupation of Crown land), section 38 (lease of Crown land), Section 39 (licence of occupation), Section 40 (right of way and easement), and Section 96 (occupational rental).

4.2.4 Agricultural Land Commission Act

The BC *Agricultural Land Commission Act* (SBC 2002, c. 36) sets the legislative framework for the establishment and administration of the agricultural lands preservation program. The Act is meant to protect agricultural land within the province. Under the Act, this land is designated as ALR.

The Agricultural Land Commission (ALC) is the agency responsible for the administration of the ALR. The OGC has a delegation agreement with the ALC that gives the OGC authority to permit oil and gas activities in the ALR. Land must be reclaimed to its pre-development agricultural condition when no longer required for an oil or gas activity.

4.2.5 Water Sustainability Act

The BC *Water Sustainability Act* (SBC 2014, c. 15) (WSA) is the principal legislation for managing the diversion and use of water resources. Section 8 of the OGAA allows the OGC to administer both Sections 10 and 11 of the WSA, including issuing change approvals and use approvals.

For changes in and about a stream, an application for a Change Approval or submission of a Notification is required under Section 11 of the *WSA*. Under the WSA, a stream is defined as "(*a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the channel of the stream has been modified, or (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer".*

Changes in and about a stream are defined in the WSA as:

- Any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream
- Any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel

4.2.6 Forest and Range Practices Act

The *Forest and Range Practices Act* (SBC 2002 c. 69) (FRPA) outlines how forest and range practices and resource-based activities are to be conducted on Crown land. It also addresses the protection of plants, animals and ecosystems while undertaking these resource-based activities.

Forestry and range land use management guidelines for wildlife are established by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNROD) under FRPA. Under FRPA and the Government Actions Regulations (Government of BC 2004), ungulate winter ranges, general wildlife measures, and wildlife habitat areas can be established for specified areas and for specified species to set objectives with respect to acceptable forest and range practices in these areas.

4.3 Wildlife Act

In general, the BC *Wildlife Act (*RSBC 1996, c. 488*)* provides a regulatory framework for the management of wildlife and, in very limited circumstance and limited to a few specifically designated species, wildlife habitat (i.e., bird nests) in the province. The *Wildlife Act* protects most native vertebrates from direct harm or harassment, regulates hunting, trapping and sport fishing, protects nesting birds and active nests that are occupied by a bird or its egg(s). The nests of some bird species are afforded specific consideration under Section 34b of the *Wildlife Act* regardless of whether they are occupied. These protected nests, as relevant to this project, include those used seasonally by peregrine falcon, burrowing owl, bald eagle, osprey, and great blue heron.

A general *Wildlife Act* permit is required for any trapping or handling of live wildlife (i.e., salvages), including species at risk.

4.4 Weed Control Act

The BC *Weed Control Act*, RSBC 1996, c.487, aims to control the spread of designated noxious plants on all provincial Crown and private land. There is an obligation under the *Act* for the land occupier to control these designated noxious plants. The *Act* requires all land occupiers to avoid establishment and dispersal of noxious weeds as defined by the *Act*.

4.5 Riparian Areas Protection Act

The *Riparian Areas Protection Act* (SBC 1997 c. 21) and associated Riparian Areas Regulation (RAR) direct local governments to protect riparian areas during new residential, commercial and industrial development. Local governments must either include riparian area protection provisions in its zoning bylaws and permits in accordance with the RAR or ensure that its bylaws and permits meet or exceed the RAR. The RAR applies only to the regional districts specified in Section 3 of the regulation, which does not include the Project area.

4.6 Regional Bylaws

The Regional District of Fraser-Fort George Zoning bylaw (*No. 2892, 2014)* applies setbacks for watercourses and wetland within its jurisdiction and regulates the type of development activity that can occur within floodplains. Where a watercourse is not specified in the bylaw, 15 m horizontal setback will apply Pursuant to the bylaw where landfill is used to achieve the required elevation, no portion of the landfill slope shall be closer than the distances noted in the bylaw, and the face of the landfill slope shall be adequately protected against erosion from floodwaters. A reduction in setback size can be obtained through a Development Variance Permit.

No applicable regional-level bylaws were identified for the Cariboo Regional District.

4.7 Municipal Bylaws

4.7.1 District Municipality of Mackenzie

No applicable municipal bylaws were identified for the District Municipality of Mackenzie.

4.7.2 City of Prince George

Riparian Protection Development Area, Official Community Plan Bylaw No. 8383, 2012

Development activities within areas designated as Riparian Protection Development Areas on Schedule B-2 of the City's Official Community Plan require a Development Permit prior to an alteration of land, new construction building additions or tree cutting. Riparian Development Permit Areas include the Fraser River and any other area within 50 m of a fish bearing watercourse. Development Permits for these areas set out conditions such as erosion and sediment control during development activities and the replanting of native vegetation following construction activities (City of Prince George 2013).

Zoning Bylaw No 7850, 2007

Leave strips within riparian protection development permit areas must remain free of development. Leave strips for commercial, industrial and institutional developments are 30 m from the top of bank.

Tree Protection Bylaw No. 6343, 1995

Pursuant to the City's Tree Protection Bylaw, no person shall cut down or allow to be cut down, a tree in areas identified as greenbelt (agricultural) lands or within Natural Environmental Development Permit Areas unless a permit has been issued. Exemptions from this bylaw include areas designated as "soil removal areas" within the Soil Removal Bylaw. 8772, 2017 where a permit has been obtained pursuant to the bylaw. However, this bylaw does apply to Development Permit Areas where the trees are located within 15 m of the visible high-water mark of a watercourse.

Sanitary Sewer Bylaw No. 7897, 2006

The Sanitary Sewer bylaw states that persons discharging, or proposing to, an industrial discharge into a public sewer, private sector, or side sewer tributary to the City Sewerage System will be required to secure a written discharge permit unless the Authorized Person has determined that a permit is not required. Industrial discharge includes discharge from any non- domestic source such as construction dewatering waste water. Construction dewatering waste: any waters or wastes generated during construction activities which may include but not limited to contaminated storm water, surface water, or groundwater.

Waste water discharge permits are issued for a period of three years unless indicated otherwise by the Authorized Person. Discharge permits are issued with conditions that demonstrate compliance with applicable federal, provincial and local enactment.

Soil Removal and Deposit Bylaw No. 8772, 2017

The City's Soil Removal and Deposit Bylaw states that no person shall Remove or Deposit unless a Long-Term Permit or Short-Term Permit has been issued for that removal or deposit. The bylaw contains exemptions for private utility corridors and as such, no permit is anticipated to be required.

4.7.3 Williams Lake

No applicable municipal bylaws were identified for Williams Lake.

4.7.4 City of Quesnel

Water Corridor Development Permit Area, Official Community Plan Bylaw No. 1630, 2007

The Water Corridor Development Permit Area has been identified within the OCP for the protection of the natural environment, its ecosystems and biological diversity. Water Corridor Development Permit Areas are identified on Schedule F6 of the OCP and include the Fraser River and Quesnel River. A Development Permit may be issued if the proponent adheres to the guidelines for development within these areas. These guidelines include consultation with provincial and federal agencies, the requirement of an assessment report by a Qualified Environmental Professional outlining potential adverse effects and mitigation measures.

Tree Protection Bylaw No. 1314, 1995

Pursuant to the Tree Protection bylaw, no person shall cut down or allow to be cut down, a tree in an area identified as: agricultural (A-1) and general industrial reserve as identified within OCP Zoning Map areas identified as having a hazard rating of “marginal” or “unsuitable” in the City’s Slope Stability Study, or in greenbelt areas identified on Schedule “B” pf the OCP unless a Tree Cutting Permit has been issued. Exemptions include areas for which a valid Soil Removal Permit has been issued.

Soil Removal and Deposit Bylaw No. 1260, Consolidated 2015

According to the bylaw, no person shall remove soil from; or deposit soil or other material on any lands within municipal boundaries without first obtaining a Soil Removal and Deposit Permit unless exempt from the bylaw per Section 9 of the bylaw. Exemptions include development for which a valid building permit has been issued and minor activities that do not substantially change topography.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS AND RISKS

This section provides a high-level overview of the potential adverse effects to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities[6] (i.e., where the anticipated construction footprint overlaps with identified features), and where considerations of environmental values may present a risk to the Project. For the purposes of this report, risks to the Project are considered in the form of additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals).

Potential Project risks are identified and ranked for land use, surface water quantity and quality, fish and fish habitat, vegetation (including species at risk), wildlife (including species at risk and species of concern identified in this report), and contaminated soils and/or groundwater. This represents an expanded list of environmental receptors compared to those considered in the Overview of the Existing Environment ((**Section 3.0**), as surface water quantity and quality are also considered at a high level. These environmental receptors were grouped into two categories as follows:

1. **Biophysical receptors:**
   - Land use:
     - Presence and potential disturbance to parks and protected areas
     - Presence and potential disturbance of ALR, with consideration to agricultural capability of soils
   - Surface water quantity and quality:
     - Presence of surface water and potential for contamination or modification to surface water flow
   - Fish and fish habitat:
     - Presence of and potential disturbance and modification of fish habitat
     - Potential harm to fish
   - Vegetation:
     - Presence and potential for spread of invasive vegetation
     - Presence and potential disturbance to areas of natural vegetation
     - Presence and potential for disturbance to plant species and communities of concern
   - Wildlife and wildlife habitat:
     - Presence of, and potential disturbance to, wildlife species notes to be of concern and to associated wildlife habitat features
     - Presence of designated critical habitat

6 For alignments with ILI as the alternative upgrade option, the overlap of all sensitive features was considered

2. Contaminated Soils/Groundwater:

Based on the results of the assessment, Risk Areas were identified where construction activities (e.g., ground disturbance at valves, bends, stations and pipeline replacement areas) is planned along the existing alignment, within APECs with medium to high risk of soil and/or groundwater contamination. Intrusive investigation is recommended at the medium and high risk APECs prior to construction to characterize soil and groundwater, as management of these materials (if contaminated) may pose a cost risk to the Project during construction**.** Risk Areas for each lateral are listed in tables in **Sections 5.1** to **5.12**. These tables do not include APECs where contaminated soil, if encountered, will likely be reused as fill or spread within the existing RoW (thus minimizing risk to the Project).

Follow-up activities are recommended to address or mitigate risks associated with each receptor. Additionally, a list of permits and approvals that are expected to be required, along with the estimated timeframe for issuance, is provided for the preferred and alternate upgrade option of each lateral.

5.1 MAC LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.1.3**.

5.1.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project is provided in **Table 5.1**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.1 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with MAC LTL 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Demonstration Forest Trails Recreation Site • Construction zones that are in the immediate vicinity of or cross the CN railway • Construction zones on Highway 39	• Temporary disruption of recreational use at the Demonstration Forest Trails Recreation Site • Potential challenges to construction access and timing related to railway and highway use	Low	• Public engagement • Engagement with CN Railway and Ministry of Transportation and Infrastructure	• Demonstration Forest Trails Recreation Site • Construction zones that are in the immediate vicinity of or cross the CN railway • Construction zones on Highway 39	• Temporary disruption of recreational use at the Demonstration Forest Trails Recreation Site • Potential challenges to construction access and timing related to railway and highway use	Low	• Public engagement • Engagement with CN Railway and Ministry of Transportation
Surface Water Quality and Quantity	• There is one bend zone located within Williston Lake (MAC LTL 168_004) and one adjacent to an isolated waterbody (MAC LTL 168_022).	• Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.)	High	• Develop and implement an EMP and conduct environmental monitoring • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation	• 17 waterbodies are crossed by the lateral of the existing lateral (MAC LTL 168_001, 003, 004, 005-S, 005-L, 006-S, 006-W, 007, 008, 009, 011, 012, 013, 017, 018, 019, 022)	• Temporary diversion of surface water • Temporary isolation of wetland habitat • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• There is one bend zone located within Williston Lake, which is a known fish-bearing waterbody	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • Aquatic life-form salvage • To the extent possible, undertake construction within the least-risk timing windows for applicable species	• 16 waterbodies, or their RMAs are crossed by the lateral of the existing lateral (MAC LTL 168_001, 003, 004, 005-S, 005-L, 006-S, 006-W, 007, 008, 009, 011, 012, 013, 017, 018, 019), including a trenchless crossing of Williston Lake	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening	Low	• Develop and implement and EMP and conduct environmental monitoring • Site restoration	• Areas of mature/sensitive native vegetation in the adjacent to the lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening	Low	• Develop and implement and EMP and conduct environmental monitoring • Site restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• Wildlife habitat features, including those identified during PFR that are near construction areas: ▫ Earthen burrow / den (W002) ▫ Aquatic features which may support amphibians (including W004 and wetlands MAC LTL 168_001, 010) ▫ Five active osprey nests (W007, W009, W010, W013, W014) • Four inactive raptor nests that may be reestablished in future years (W001, W003, W006, W015)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement and EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features, including those identified during PFR along the lateral: ▫ Earthen burrow / den (W002) ▫ Aquatic features which may support amphibians (including WO04 and W005, and wetlands MAC LTL 168_001, 006-W, 007,010 and 018) ▫ Five active osprey nests (W007, W009, W010, W013, W014) • Seven inactive raptor nests that may be reestablished in future years (W001, W003, W006, W008, W011, W012, W015)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement and EMP and conduct environmental monitoring • To the extent practicable , undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.1.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.2**.

Table 5.2 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for MAC LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
MAC LTL 168 (Inland Gas Upgrade Project)						
A1	Scrap yard and machinery parking (1010 and 1020 Frontage Road, Mackenzie)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Adjacent	Medium	150	NC-04
A5	Railway crossing (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	20	NC-05
A6	Railway crossing (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	10	NC-06
A7	Pile of railway ties (west of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	35	NC-06
A10/C1	Railway crossing (west of Hwy 39 and north of Mischinsinlika Creek, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	75	NC-14

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds

If additional construction work is completed outside of the previously identified areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater may be encountered.

5.1.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of permits and approvals that will likely need to be obtained is provided in **Table 5.3** along with the estimated timeframe for issuance.

Table 5.3 Regulatory Approvals and Timelines for MAC LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	Yes	Yes
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	Unlikely	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	Yes	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Yes	Yes
MFLNROD	General Wildlife Salvage Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Yes	Yes
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	Yes	Yes

5.2 MAC LOP 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.2.1** and **5.2.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.2.3**.

5.2.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.4**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.4 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with MAC LOP 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Demonstration Forest Trails Recreation Site • Construction zones that are in the immediate vicinity of or cross the CN railway • Construction zones on Highway 39	• Temporary disruption of recreational use at the Demonstration Forest Trails Recreation Site • Potential challenges to construction access and timing related to railway and highway use	Low	• Public engagement • Engagement with CN Railway and Ministry of Transportation and Infrastructure	• Demonstration Forest Trails Recreation Site • Construction zones that are in the immediate vicinity of or cross the CN railway • Construction zones on Highway 39	• Temporary disruption of recreational use at the Demonstration Forest Trails Recreation Site • Potential challenges to construction access and timing related to railway and highway use	Low	• Public engagement • Engagement with CN Railway and Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• There is one bend zone adjacent to an isolated waterbody (MAC LTL 168_022).	• Temporary isolation of work site • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.)	Low	• Develop and implement an EMP and conduct environmental monitoring • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation	• 6 waterbodies (or their RMAs) cross the lateral or overlap the existing lateral (MAC LTL 168_009, 011, 012, 013, 017, 022)	• Temporary loss of aquatic habitat area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 5 streams, wetlands, or lakes (or their RMAs) cross the lateral of the existing lateral (MAC LTL 168_009, 011, 012, 013, 017)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct fish survey to confirm fish and fish habitat presence/absence to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid fish and fish habitat • Fish habitat restoration • To the extent practicable, undertake construction within the least-risk timing windows for applicable species
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration	• Areas of mature/sensitive native vegetation in the adjacent to the existing lateral alignment	• Temporary modification or permanent loss of mature, native vegetation as a result of RoW clearing and widening	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• Wildlife habitat features, including those identified during PFR that are near anticipated construction areas: ▫ Earthen burrow / den (W002) ▫ Aquatic features which may support amphibians (including W004) ▫ One active osprey nest (W007) • Three inactive raptor nests that may be reestablished in future years (W001, W003, W006)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife from construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features, including those identified during PFR along the existing lateral alignment: ▫ Earthen burrow / den (W002) ▫ Aquatic features which may support amphibians (including W004 and W005, and wetland MAC LTL 168_010) ▫ One active osprey nest (W007) • Three inactive raptor nests that may be reestablished in future years (W001, W003, W006)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife because of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.2.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.5**.

Table 5.5 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for MAC LOP 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
MAC LOP 168 (Inland Gas Upgrade Project)						
A10/C1	Railway crossing (west of Hwy 39 and north of Mischinsinlika Creek, Mackenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	40	NC-14

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.2.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of permits and approvals that are expected to be needed is provided in **Table 5.6** along with the estimated timeframe for issuance.

Table 5.6 Regulatory Approvals and Timelines for MAC LOP 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Yes
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	N
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Yes	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Yes
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	Yes	Yes

5.3 BCF LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.3.1**and **5.3.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.3.3**.

5.3.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.7**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.7 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with BCF LTL 168

Environmental Receptor	Preferred Option (PLR)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones that are in the immediate vicinity of or cross the CN railway	• Potential challenges to construction access and timing related to railway use	Low	• Engagement with CN Railway	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction zones that are in the immediate vicinity of or cross the CN railway	• Potential challenges to construction access and timing related to railway use	Low	• Engagement with CN Railway
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• No surface waterbodies cross the lateral or overlap the anticipated construction area	No adverse effects anticipated	Nil	• N/A
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A
Vegetation	• Patch of old growth forest at the east end of the existing lateral alignment	• Temporary modification or permanent loss of mature, native vegetation from ROW clearing and widening	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction could potentially overlap within the patch of old growth forest on the east side of existing lateral alignment	• Temporary modification or permanent loss of mature, native vegetation because of ROW clearing and widening	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration
Wildlife	• No specific features were identified during the PFR, but sensitive features potentially present include wildlife habitat features such as nests, roosts, or burrows in the vicinity the lateral	• Destruction of wildlife habitat features (including nests and dens) during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Direct injury or mortality resulting from equipment operation	Low	• To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features such as nests, roosts, or burrows near construction areas (none identified during PFR)	• Destruction of wildlife habitat features (including nests and dens) during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Direct injury or mortality resulting from equipment operation	Low	• To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.3.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.8**.

Table 5.8 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for BCF LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
BCF LTL 168 (PLR)						
B1	Pulp mill - MacKenzie Pulp Mill Corporation (1000 Coquiwaldie Road, MacKenzie)	PCBs, chlorinated and non-chlorinated phenols, VOCs, metals	On-Site	Medium	30	NC-05
B2	Railway crossing (North of Coquiwaldie Road, MacKenzie)	BTEX/VPH, EPH, PAHs, metals	On-site	Medium	25	NC-05

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.3.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of permits and approvals that are expected is provided in **Table 5.9** along with the estimated timeframe for issuance.

Table 5.9 Regulatory Approvals and Timelines for BCF LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PLR)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	No
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	No
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	No

5.4 NWP LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.4.1** and **5.4.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.4.3**.

5.4.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.10**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.10 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with NWP LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• ALR land at the location of PRS Site #1	• Permanent loss of agricultural land within PRS Site #1 footprint	Low	• Site restoration	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction zones that overlap with the ALR • Construction zones within the Community Forest • Construction zones that cross or are in the immediate vicinity of the CN railway track • High industrial traffic areas associated with the Northwood Pulp Mill	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Temporary disruption of community-based activities in the Community Forest • Potential challenges to construction access and timing related to railway use and industrial traffic	Medium	• Site restoration • Public engagement • Engagement with CN Railway and Northwood Pulp Mill
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface waterbodies could not be determined. However, the following surface waterbodies may be adversely affected: • 5 waterbodies cross the lateral of the existing lateral (NWP LTL 168_001, 002, 003, 005, 007)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Assess mapped watercourses (e.g., confirm presence, collect water quality, characterize habitat values and determine whether fish present) • Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• There is no fish habitat that overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface water could not be determined. However, the following surface water may be adversely affected: • 5 potentially fish-bearing watercourses cross the lateral of the existing lateral (NWP LTL 168_001, 002, 003, 005, 007)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• 2 sites of invasive vegetation within vicinity of the proposed location of PRS (Site #1)	• Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Permanent loss of vegetation (mostly grass and common dandelion) within the footprint of the PRS (Site #1)	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Areas of mature/sensitive native vegetation in the footprint of potential construction areas • 2 sites of invasive vegetation at the east end of the lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of RoW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests that may be present near the PRS (Site #1) location, particularly in the patch of forest adjacent to the PRS location	• Temporary disturbance and displacement of wildlife as a result of construction activities	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features. No specific features were identified during the PFR, but sensitive features potentially present include nests, burrows, wetlands and aquatic features that may support amphibians in the vicinity construction areas • Construction areas adjacent to the Fraser River where known occurrence of white sturgeon occurs	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic species (including white sturgeon)	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.4.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.11**.

Table 5.11 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for NWP LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
NWP LTL 168 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.4.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.12** along with the estimated timeframe for issuance.

Table 5.12 Regulatory Approvals and Timelines for NWP LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Possibly
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Possibly
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	Possibly
City of Prince George	Riparian Development Permit	Up to 2 months	No	Possibly
	Tree Cutting Permit		No	Possibly
	Sanitary Sewer Bylaw		No	Possibly
	Soil Removal and Deposit Permits		No	No

5.5 NWP LOP 219 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.5.1** and **5.5.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.5.3**.

5.5.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.13**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.13 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with NWP LOP 219

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• ALR land at the location of PRS Site #1	• Permanent loss of agricultural land within PRS Site #1 footprint	Low	• Site restoration	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction zones that overlap with the ALR • Construction zones within the Community Forest • Construction zones that cross or are in the immediate vicinity of the CN railway	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Temporary disruption of community-based activities in the Community Forest • Potential challenges to construction access and timing related to railway use	Low	• Site restoration • Public engagement • Engagement with CN Railway
Surface Water Quality and Quantity	• No waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface water could not be determined. However, the following surface water may be adversely affected: • 4 waterbodies cross the lateral of the existing lateral (NWP LTL 168_001, 002, 003, 005,)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Assess mapped watercourses (e.g., confirm presence, collect water quality, characterize habitat values and determine whether fish present) • Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface water could not be determined. However, the following surface waterbodies may be adversely affected: • 4 potentially fish-bearing watercourses cross the lateral of the existing lateral (NWP LTL 168_001, 002, 003, 005,)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• 2 sites of invasive vegetation within vicinity of the proposed location of PRS (Site #1)	• Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Permanent loss of vegetation (mostly grass and common dandelion) within the footprint of the PRS (Site #1)	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Areas of mature/sensitive native vegetation in the footprint of potential construction areas • 2 sites of invasive vegetation at the east end of the lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests that may be present near the PRS (Site #1) location, particularly in the patch of forest adjacent to the PRS location	• Temporary disturbance and displacement of wildlife as a result of construction activities	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features. No specific features were identified during the PFR, but sensitive features potentially present include nests, burrows, wetlands and aquatic features that may support amphibians in the vicinity construction areas • Construction areas adjacent to the Fraser River where known occurrence of white sturgeon occurs	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic wildlife species	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.5.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.14**.

Table 5.14 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for NWP LOP 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
NWP LOP 219 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.5.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.15** along with the estimated timeframe for issuance.

Table 5.15 Regulatory Approvals and Timelines for NWP LOP 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Possibly
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Possibly
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	Possibly
City of Prince George	Riparian Development Permit	Up to 2 months	No	Possibly
	Tree Cutting Permit		No	Possibly
	Sanitary Sewer Bylaw		No	Possibly
	Soil Removal and Deposit Permits		No	No

5.6 PG3 LTL 219 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.6.1** and **5.6.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.1.3**.

5.6.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.16**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.16 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with PG3 LTL 219

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• ALR land at the location of PRS Site #1	• Permanent loss of agricultural land within PRS Site #1 footprint	Low	• Site restoration	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction zones that overlap with the ALR • Construction zones within the community forest / green space	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Temporary disruption of recreational and community-based activities in the community forest / green space	Low	• Site restoration • Public Engagement
Surface Water Quality and Quantity	• No surface waterbodies interact with the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface waterbodies could not be determined. However, the following surface waterbodies may be adversely affected: • 4 waterbodies cross the alignment of the existing lateral (PG3 LTL 219_001, 002, 003, NWP LTL 168_007)	• Temporary diversion of surface water • Temporary isolation of wetland habitat • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP that address factors including erosion and sediment control and spill prevention and response • conduct environmental monitoring • Assess mapped watercourses (e.g., confirm presence, collect water quality, characterize habitat values and determine whether fish present) • Construction timing (i.e., avoid periods of heavy precipitation) • ;
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with fish habitat could not be determined. However, the following fish habitat may be adversely affected: • 4 potentially fish-bearing watercourses cross the alignment of the existing lateral (PG3 LTL 219_001, 002, 003, NWP LTL 168_007)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• 2 sites of invasive vegetation within vicinity of the proposed location of PRS (Site #1)	• Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Permanent loss of vegetation (mostly grass and common dandelion) within the footprint of the PRS (Site #1)	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Areas of mature/sensitive native vegetation in the footprint of potential construction areas • 2 sites of invasive vegetation at the east end of the lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests that may be present near the PRS (Site #1) location, particularly in the patch of forest adjacent to the PRS location	• Temporary disturbance and displacement of wildlife because of construction activities	Low	• To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features. No specific features were identified during the PFR, but sensitive features potentially present include nests and burrows and wetlands in the vicinity construction areas	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic species (including white sturgeon)	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.6.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.17**.

Table 5.17 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for PG3 LTL 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
PG3 LTL 219 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.6.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.18** along with the estimated timeframe for issuance.

Table 5.18 Regulatory Approvals and Timelines for PG3 LTL 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Possibly
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Possibly
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	Possibly
City of Prince George	Riparian Development Permit	Up to 2 months	No	Possibly
	Tree Cutting Permit		No	Possibly
	Sanitary Sewer Bylaw		No	Possibly
	Soil Removal and Deposit Permits		No	No

5.7 HUS LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.7.3**.

5.7.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.1**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.19 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with HUS LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Proposed location of PRS is adjacent to the CN track and Canfor Pulp and Paper	• Potential challenges to construction access and timing related to railway use and industrial traffic	Medium	• Engagement with CN railway and industries	• High industrial traffic area associated with the Husky Refinery and Canfor Pulp and Paper • Lateral parallels CN track	• Potential challenges to construction access and timing related to railway use and industrial traffic	Medium	• Engagement with CN railway and industries
Surface Water Quality and Quantity	• No surface waterbodies cross or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• One man-made settling pond is within 35 m of the lateral and potentially overlaps the anticipated construction area.	• Potential effects are limited to surface runoff during construction mobilizing sediment into the adjacent settling pond	Low	• Develop and implement an EMP and conduct environmental monitoring • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A
Vegetation	• 1 sites of invasive vegetation was observed within vicinity of the proposed PRS	• Permanent loss of vegetation (mainly grasses and horsetail) within the footprint of the PRS • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment	Low	• Develop an invasive vegetation management plan to be implemented during construction • Site restoration	• Section of the stand of mature mixed forest at the northwest end of the study area overlapped by lateral • 7 sites of invasive vegetation within vicinity of lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include: • Nests that may be present near the proposed location of the PRS	• Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	• Wildlife habitat features, including those identified during PFR that are near lateral: ▫ Active osprey nest (W001) • Forested habitat in northeastern part of the study area	• Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.7.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.20**.

Table 5.20 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for HUS LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
HUS LTL 168 (PLR)						
H2/I1	Fortis pump station - Site Registry entry noting mercury contamination (2789 Pulpmill Road, Prince George)	Mercury	On-Site	High	25	NC-32
H3/I2	Pulp mill - East Canfor Pulp Mill (2533 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	50 m east	Medium	530	NC-32
I3	Pulp mill chemical manufacturing – ChemTrade (2711 Prince George Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, VOCs	120 m west	Medium	380	NC-32
I6	Pulp mill - West Canfor Pulp Mill (2533 Pulpmill Road, Prince George)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	200 m south / 300 m west	Medium	1300	NC-32

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is undertaken away from the previously identified PRS construction areas the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.7.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.21** along with the estimated timeframe for issuance.

Table 5.21 Regulatory Approvals and Timelines for HUS LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option PRS)	Required for Alternative Option PLR)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	No
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	No
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	No
City of Prince George	Riparian Development Permit	Up to 2 months	No	No
	Tree Cutting Permit		No	Yes
	Sanitary Sewer Bylaw		Possibly	Possibly
	Soil Removal and Deposit Permits		No	No

5.8 PGP LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.8.1** and **5.8.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.8.3**.

5.8.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.22**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.22 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with PGP LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zone in the immediate vicinity of the CN railway	• Potential challenges to construction access and timing related to railway use	Low	• Engagement with CN railway	• Construction zones that cross or are in the immediate vicinity of the CN railway	• Potential challenges to construction access and timing related to railway use	Low	• Engagement with CN railway
Surface Water Quality and Quantity	• No surface waterbodies cross or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• The replacement pipeline is expected to cross under the Fraser River (PGP LTL 168_002) via trenchless construction	• Groundwater management in the drill entry and exit pits • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	No adverse effects anticipated	Nil	• N/A	• The replacement pipeline is expected to cross under the Fraser River (PGP LTL 168_002) via trenchless construction	• Temporary modification or permanent destruction of fish habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Where practical, design and plan Project activities to avoid fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Site restoration
Vegetation	• Areas of mature mixed forest immediately east (potentially overlapping) with the proposed location of the PRS • One of invasive vegetation species within vicinity of the proposed location of the PRS	• Permanent loss of vegetation (primarily horsetail, grasses and thimbleberry) within the footprint of the PRS. Temporary modification or permanent loss of mature, mixed forest at the proposed location of the PRS • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction • Site restoration	• Areas of mature mixed forest near lateral on the banks of the Fraser River • One species of invasive vegetation within vicinity of lateral • Potential damage to or destruction of plant species of concern if present	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include: • Nests that may be present near the proposed location of the PRS	• Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include: • Nests that may be present near the construction areas • Construction areas near the Fraser River (areas where of known occurrence white sturgeon are near the lateral)	• Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic or semi-aquatic wildlife species	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.8.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.23**.

Table 5.23 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for PGP LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
PGP LTL 168 (Inland Gas Upgrade Project)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is undertaken away from the previously identified PRS construction areas the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.8.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.24** along with the estimated timeframe for issuance.

Table 5.24 Regulatory Approvals and Timelines for PGP LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Unlikely
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Possibly
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	Possibly	Yes
City of Prince George	Riparian Development Permit	Up to 2 months	No	Yes
	Tree Cutting Permit		Yes	Yes
	Sanitary Sewer Bylaw		No	Possibly
	Soil Removal and Deposit Permits		No	No

5.9 PG1 LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.9.1** and **5.9.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.9.3**.

5.9.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.25**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.25 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with PG1 LTL 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones that cross or are in the immediate vicinity of the CN railway • Construction zones that overlap with the ALR • Construction zone that overlaps with Highway 16E • Construction zones within the Community Forest	• Potential challenges to construction access and timing related to railway use • Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Temporary disruption of community-based activities in the Community Forest	Medium	• Engagement with CN railway and Ministry of Transportation and Infrastructure • Site restoration • Public engagement	• Construction zones that cross or are in the immediate vicinity of the CN railway • Construction zone that overlaps with Highway 16E • Construction zones that overlap with the ALR • Construction zones within the Community Forest	• Potential challenges to construction access and timing related to railway use • Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Temporary disruption of community-based activities in the Community Forest	High	• Engagement with CN railway and Ministry of Transportation and Infrastructure • Site restoration • Public engagement
Surface Water Quality and Quantity	• No surface waterbodies overlap the anticipated construction areas.	• No adverse effects anticipated	Nil	• N/A	• 2 streams cross the lateral and/or overlap anticipated construction areas (PG1 LTL 168_001, 002)	• Temporary diversion of surface water • Temporary isolation of wetland habitat • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• No fish habitat overlaps the anticipated construction areas.	• No adverse effects anticipated	Nil	• N/A	• 2 potentially fish-bearing watercourses cross the lateral and/or overlap anticipated construction areas (PG1 LTL 168_001, 002)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature mixed forest on the south side of the central portion of lateral that are overlapped by anticipated construction areas • Construction areas within the vicinity of invasive vegetation	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • The wetted area associated with NC_PG1 LTL 168_002 (Bittner Creek) should be surveyed for small-flowered lousewort • Develop an invasive vegetation management plan to be implemented during construction • Site restoration	• Areas of mature mixed forest on the south side of the central portion of lateral that are overlapped by anticipated construction areas • Eight sites of invasive vegetation near the lateral	• Temporary modification or permanent loss of mature, native vegetation as a result of RoW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • The wetted area associated with NC_PG1 LTL 168_002 (Bittner Creek) should be surveyed for small-flowered lousewort • Develop an invasive vegetation management plan to be implemented during construction • Site restoration
Wildlife	• Wildlife habitat features near construction areas, including the black bear den identified during PFR (W001) • Construction areas near the Fraser River where wildlife activity may be high	• Temporary disturbance and displacement of wildlife as a result of construction activities • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic wildlife species	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Determine the location of the black bear den and avoid disturbance of this area during construction. Appropriate work timing windows and buffers around location of den should be determined by a Qualified Environmental Professional • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features near the lateral, including the black bear den identified during PFR (W001) • Construction areas near the Fraser River where wildlife activity may be high	• Temporary disturbance and displacement of wildlife as a result of construction activities • Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Direct injury or mortality resulting from equipment operation • Introduction of deleterious substances into aquatic habitat that may negatively affect aquatic wildlife species	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Determine the location of the black bear den and avoid disturbance of this area during construction. Appropriate work timing windows and buffers around location of den should be determined by a Qualified Environmental Professional • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.9.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.26**.

Table 5.26 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for PG1 LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
PG1 LTL 168 (Inland Gas Upgrade Project)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.9.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals provided in **Table 5.27** along with the estimated timeframe for issuance.

Table 5.27 Regulatory Approvals and Timelines for PG1 LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Yes
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	Yes
City of Prince George	Riparian Development Permit	Up to 2 months	No	Yes
	Tree Cutting Permit		Yes	Yes
	Sanitary Sewer Bylaw		Possibly	Possibly
	Soil Removal and Deposit Permits		No	No

5.10 PG2 219 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.10.1** and **5.10.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.10.3**.

5.10.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.28**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.28 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with PG2 219 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• ALR land at the location of PRS Site #2	• Permanent loss of agricultural land within PRS Site #2 footprint	Low	• Site restoration	• High industrial traffic areas at west end of lateral • Construction zones that overlap with the ALR	• Potential challenges to construction access and timing related to industrial traffic • Temporary or permanent impact on soils and agricultural capacity of properties within project during construction	High	• Site restoration
Surface Water Quality and Quantity	• No surface waterbodies cross or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface water could not be determined. However, the following surface water may be adversely affected: • 9 waterbodies cross, or are adjacent to the lateral of the exiting lateral (PG2 219 168_001, 002, 003, 004, 005, 006, 007, 008, 009)	• Temporary diversion of surface water • Temporary isolation of wetland habitat • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with fish habitat could not be determined. However, the following fish habitat may be adversely affected: • 8 potentially fish-bearing watercourses cross the lateral of the existing lateral (PG2 219 168_002, 003, 004, 005, 006, 007, 008, 009)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• None identified	• Permanent loss of vegetation (cultivated hay) within the footprint of the PRS (Site #2)	Nil	• Develop and implement an EMP and conduct environmental monitoring • Site restoration	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Areas of mature mixed forest (particularly in the western part of the lateral) that are in the footprint of potential construction areas • Sites of invasive vegetation near potential construction areas	• Temporary modification or permanent loss of mature, native vegetation as a result of RoW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include ground nests that may be present in the vicinity of the PRS (Site #2)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features. No specific features were identified during the PFR, but sensitive features potentially present include nests and burrows in the vicinity construction areas	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.10.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.29**.

Table 5.29 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for PG2 219 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
PG2 219 168 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.10.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and is provided in **Table 5.3** along with the estimated timeframe for issuance.

Table 5.30 Regulatory Approvals and Timelines for PG2 219 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Possibly
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly
Regional District of Fraser-Fort George	Development Variance Permit	Up to 2 months	No	Possibly
City of Prince George	Riparian Development Permit	Up to 2 months	No	Possibly
	Tree Cutting Permit		No	Possibly
	Sanitary Sewer Bylaw		Possibly	Possibly
	Soil Removal and Deposit Permits		No	No

5.11 CAR LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.11.1** and **5.11.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.11.3**.

5.11.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.31**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.31 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CAR LTL 168

Environmental Receptor	Preferred Option (PLR)				Alternative Option (PRS)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Industrial traffic areas associated with Cariboo Pulp and Paper	• Potential challenges to construction access and timing related to industrial traffic	Low	• Engagement with Caribou Pulp and Paper	• None identified	• None anticipated	Low	• None required
Surface Water Quality and Quantity	• No surface waterbodies were identified during desktop studies that cross or overlap the anticipated construction area	• No adverse effects anticipated	Low	• Recommend conducting a second round of PFR to assess the presence of watercourses along the length of the lateral	• No surface waterbodies cross or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A
Fish and Fish Habitat	• No fish habitat identified during desktop studies that crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Low	• Recommend conducting PFR to assess the presence of watercourses along length of lateral	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A
Vegetation	• Construction footprint for ILI was • Areas of mature forest along eastern part of the lateral • Sites of invasive vegetation in the vicinity of potential construction areas • One known occurrence of a plant species of concern (Sprengel's sedge) that overlaps the study area	• Temporary modification or permanent loss of mature, native vegetation as a result of RoW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern, if present	Low	• Recommend conducting PFR to assess the presence of invasive vegetation and potential plant species of concern along the length of lateral • Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction • Site restoration	• Two sites of invasive vegetation in the vicinity of the proposed location of the PRS (Site #3) • One known occurrence of a plant species of concern (Sprengel's sedge) that overlaps the study area	• Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction •

Environmental Receptor	Preferred Option (PLR)				Alternative Option (PRS)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific wildlife habitat features were identified during the PFR, but sensitive features potentially present include nests and burrows in the vicinity construction areas	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Direct injury or mortality resulting from equipment operation	Low	• Recommend conducting PFR to assess the presence of wildlife and wildlife habitat features along the length of lateral • Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests and burrows that may be present in the vicinity of the PRS (Site #3) location, particularly in the areas of mature vegetation adjacent to the PRS location	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Species with nests or residences near the lateral are likely acclimatized to industrial activities, so potential for disturbance is considered relatively low • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required

5.11.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.32**.

Table 5.32 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CAR LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk (m)	Figure
CAR LTL 168 (PLR)						
K1	Pulp Mill - Cariboo Pulp and Paper Company (50 N Star Road, Quesnel)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	On-site	Medium	100	NC-42

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated biphenyls
VOCs – Volatile Organic Compounds

5.11.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and is provided in **Table 5.33** along with the estimated timeframe for issuance.

Table 5.33 Regulatory Approvals and Timelines for CAR LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PLR)	Required for Alternative Option (PRS)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	Unlikely	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Unlikely	No
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Unlikely	No
City of Quesnel	Water Corridor Development Permit Area	Up to 2 months	Yes	Yes
	Tree Cutting Permit		Unlikely - exempt if Soil Removal Permit has been issued	Unlikely - exempt if Soil Removal Permit has been issued
	Soil Removal and Deposit Permit		Yes	Yes

5.12 WIL LP1 168 and WIL LP2 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.12.1** and **5.12.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.12.3**.

5.12.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.34**. The follow up activities and mitigation measures provided are not exhaustive and are limited to those activities and measures that are anticipated to represent a cost to the Project.

Table 5.34 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with WIL LP1 168 and WIL LP2 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• ALR land at the location of PRS Site #4	• Permanent loss of agricultural land within PRS Site #4 footprint	Low	• Site restoration	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Construction zones that overlap with the ALR • Williams Lake Airport	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Potential challenges to construction access and timing related to airport traffic	Medium	• Site restoration • Engagement with Williams Lake Airport
Surface Water Quality and Quantity	• No surface waterbodies cross or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with surface waterbodies could not be determined. However, the following surface waterbodies may be adversely affected: • 2 watercourses cross the alignment of the existing lateral (WIL LP1_001 and WIL LP2_001)	• Temporary diversion of surface water • Temporary isolation of wetland habitat • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation;
Fish and Fish Habitat	• No fish habitat crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with fish habitat could not be determined. However, the following fish habitat may be adversely affected: • 2 potentially fish-bearing watercourses cross the alignment of the existing lateral (WIL LP1_001 and WIL LP2_001)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• One site of invasive vegetation within vicinity of the proposed location of the PRS (Site #4)	• Permanent loss of vegetation in the footprint of the PRS (Site #4) • There is currently a stand of fire-damaged Douglas-fir • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Areas of mature forest that are in the footprint of potential construction areas • Approved OGMA immediately southeast of the Williams Lake airport • Sites of invasive vegetation in the vicinity of potential construction areas	• Temporary modification or permanent loss of mature, native vegetation (including the approved OGMA) as a result of RoW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable , plan construction activities to avoid the OGMA • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests and burrows that may be present in the vicinity of the PRS (Site #4) location, particularly in the areas of mature vegetation in the footprint of the PRS location	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Wildlife habitat features. No specific features were identified during the PFR, but sensitive features potentially present include nests and burrows in the vicinity construction areas	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.12.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.35** and **Table 5.36**.

Table 5.35 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for WIL LP1 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
WIL LP1 168 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

Table 5.36 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for WIL LP2 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
WIL LP2 168 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is undertaken away from the previously identified ILI construction areas (valves, bends, pressure regulation stations), the location of the work should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.12.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of these permits and approvals is provided in **Table 5.37** along with the estimated timeframe for issuance.

Table 5.37 Regulatory Approvals and Timelines for WIL LP1 168 and WIL LP2 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Possibly
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Possibly
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Possibly

6.0 GUIDING DOCUMENTS, BEST MANAGEMENT PRACTICES, AND MITIGATION MEASURES

Project activities have the potential to negatively impact environmental receptors associated with the proposed laterals. Many of these impacts can be avoided or minimized through implementation of standard best practices and mitigation measures that may be developed and implemented to minimize potential adverse effects and keep the Project in compliance with applicable legislation, regulations, and policies.

6.1 Guiding Documents and Best Management Practices

Guiding documents and Best Management Practices (BMPs) ensure a project is planned and carried out in compliance with standard, time tested and industry-specific methods or procedures. Guiding documents and BMPs that should be followed during Project activities are provided below.

6.1.1 Guiding Documents

- A Field Guide to Fuel Handling, Transportation and Storage (MWLAP 2002)
- A User's Guide to Working in and Around Water (MOE 2009*a*)
- BC OGC Environmental Protection and Management Guide Version 2.6 (OGC 2018)
- BC Water Quality Guidelines (MOE 2006)
- Fisheries Protection Policy Statement (DFO 2013*a*)
- FortisBC Generic Environmental Management Plan Low to Medium Risk Projects (Westland 2011)
- FortisBC Generic Environmental Management Plan for Work in and About Water (Tera 2015)
- Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing ((MOE 2009*b*)
- Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013*b*)
- Oil and Gas Waste Regulation – Users Guide (DRAFT) (MOE 2007)
- Standards and Best Practices for Instream Works: Pipeline Crossings (MOE & DFO 2015)

6.1.2 Best Management Practices

- Best Management Practices for Amphibian and Reptile Salvages in British Columbia (Wind et al. 2013)
- Best Management Practices for Bats in British Columbia (Holroyd and Craig 2016)
- Best Practices for Managing Invasive Plants on Oil and Gas Operations (PRRD and ISCBC 2013)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014)
- Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia (MFLNRO 2014)
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE 2013)
- Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1993)
- Region 7 Omineca – Reduced Risk Timing Windows for Fish and Wildlife (WLAP 2005)

6.2 Mitigation Measures

Project-specific and site-specific mitigation measures are typically developed once the project design, timing, footprint and construction methods are known. They are developed and customized to minimize/reduce an anticipated adverse effect.

6.2.1 Design Considerations

To the extent practicable, Project design should avoid impacts to sensitive habitats and species. Activities with locational flexibility (e.g., equipment storage, temporary workspaces) should be situated away from sensitive areas or configured to avoid interacting with the sensitive habitat or feature.

6.2.2 Project Timing

Project construction should be timed to avoid or minimize impacts to sensitive environmental receptors. There are least-risk timing windows established as guidelines to protect fish species, breeding birds and sensitive periods for other wildlife species.

6.2.2.1 Breeding Bird and Bat Least Risk Windows

Where possible, vegetation clearing and removal should be conducted outside of the breeding bird nesting period to avoid disturbance or destruction of active bird nests. The general nesting period for migratory birds may start as early as mid-March and extend until late August (ECCC 2017). The following resources provide applicable breeding bird windows; however, nesting periods for each lateral should be determined by a qualified environmental professional (QEP):

- Government of Canada region-specific nesting period calendars (ECCC 2017)
- Bird Studies Canada Nesting Calendar Query Tool (Bird Studies Canada 2017)

If the breeding bird window cannot be avoided, pre-construction nest surveys should be undertaken by a QEP prior to any clearing of vegetation within suitable nesting habitat.

There are 17 species of bats reported to occur regularly in BC (Nagorsen et al. 2018). Eight species are provincially red- or blue- listed (CDC 2018). Two species are listed by SARA as endangered; little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis)*, and one species (spotted bat (*Euderma maculatum*)), is listed as special concern. Additional guidance (Forestry specific BMPs for bats) are currently being developed by as Chapter 7 in the provincial BMP series (MOE 2016). Specific considerations, including timing restrictions, are being afforded to tree-type nursery roosts. In accordance with the DRAFT guidance, Hemmera recommends that a QEP be consulted if removal of trees is anticipated, as this activity may affect tree roosting habitat for bats, including little brown myotis and northern myotis. Site specific scheduling may be required when non-volant bat pups may be present in tree roosts.

6.2.2.2 Fisheries Least Risk Timing Windows

Fisheries work windows have been developed to minimize impacts to fish within streams and waterbodies. Any construction within fish-bearing streams should take place during these windows. The following resources can be used to determine applicable fisheries timing windows:

- Cariboo Region Terms and Conditions and Timing Windows (MOE 2004)
- Omineca Region Terms and Conditions and Timing Windows (MWLAP 2004*b*)

6.2.2.3 Amphibian and Turtle General Least Risk Periods

Amphibians and turtles are sensitive to work in and around aquatic features, particularly around ponds and wetlands. In areas where amphibians and turtles are expected, construction should be avoided during hibernation, breeding and migration periods, as determined by a QEP.

6.2.3 Fish and Wildlife Salvage

Prior to any disturbance with aquatic habitats where fish or wildlife may be encountered, aquatic lifeform (i.e., amphibian and fish) salvages are recommended. Any salvage will require necessary permits under the *Wildlife Act* (and potentially *SARA*) and the *Fisheries Act* if salmonids are expected.

6.2.4 Site Restoration

Areas disturbed during construction should be restored to meet or improve upon pre-construction conditions, particularly for work within the ALR, in and around fish habitat, and near important wildlife habitat features. Project-specific restoration plans should be developed that outline how to stabilize any disturbed areas while maximising the resultant conditions and habitat values for environmental receptors.

6.2.5 Contaminated Soil and Groundwater Management

Within the APECs identified along the existing lateral alignments, the potential for contaminated soil and groundwater to be encountered during construction poses a risk to the Project. Where construction work is planned within medium- and high-risk APECs, additional soil and groundwater investigation is recommended to determine if contamination is present, quantify expected volumes of soil and groundwater that will require management, and refine the estimated liability. The investigation will allow for the development of a soil and water management plan to be used during Project planning (e.g., tendering) and will guide the management of these materials during construction. Within low-risk APECs, the potential for encountering contamination is limited and, as such, any contaminated soil and/or groundwater encountered during construction activities will be managed on a case by case basis.

6.2.6 Environmental Management Plan and Environmental Monitoring

All construction should be undertaken in accordance with FortisBC's Generic Environmental Management Plans (Tera 2015). Additionally, project-specific Construction Environmental Management Plan(s) (CEMP) should be developed by a QEP. CEMPs should address factors such as erosion and sediment control, spill prevention and response, and provide other applicable site-specific measures to avoid or mitigate potential negative impacts to environmental resources.

Environmental construction monitoring should also be utilized to ensure the proper implementation of these mitigation measures and to confirm that any potential negative effects to the environment are avoided or minimized.

7.0 CLOSURE

The content of this report is based on information obtained during desktop studies and PFR activities. The findings presented herein should be considered within the context of the scope of work and Project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

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8.0 REFERENCES

BCUC. 2015. 2015 Certificate of Public Convenience and Necessity Application Guidelines.

Bird Studies Canada. 2017. Nesting Calendar Query Tool. <http://www.birdscanada.org/volunteer/pnw/rnest/warning.jsp>. Accessed 11 Mar 2017.

BirdLife International, Bird Studies Canada, and Nature Canada. 2018. Important Bird Areas in Canada: Site catalogue. Online Database. <http://www.ibacanada.ca/explore.jsp?lang=EN>.

CBC News. 2017. Wildfire near Williams Lake, B.C., forces airport evacuation. CBC News The Morning Brieft Newsletter. <https://www.cbc.ca/news/canada/british-columbia/williams-lake-airport-1.4195903>.

BC CDC. 2017. BC Species and Ecosystems Explorer. BC Conservation Data Centre (CDC); BC Ministry of Environment, Victoria, BC. <http://a100.gov.bc.ca/pub/eswp/>. Accessed 20 Sep 2017.

Chilibeck, B., G. Chislett, and G. Norris. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/Library/165353.pdf>.

City of Prince George. 2013. City of Prince George: Riparian Protection Development Permits: A Guide through the Process. <https://www.princegeorge.ca/Business%20and%20Development/Documents/Planning%20and%20Development/INFO_Riparian%20DP%20Process%20Guide.pdf>.

DataBC. 2017. New iMapBC 2.0. Government of British Columbia - DataBC. Online Database. <http://www.data.gov.bc.ca/dbc/geographic/view_and_analyze/imapbc/index.page>. Accessed 7 Mar 2017.

DataBC. 2018. DataBC. Government of British Columbia - DataBC. Online Database created by the BC Ministry of Forests, Lands and Natural Resource Operations. <https://data.gov.bc.ca/>.

DFO. 2013*a*. Fisheries Protection Policy Statement. Fisheries and Oceans Canada, Ottawa, ON. <http://www.dfo-mpo.gc.ca/pnw-ppe/pol/PolicyStatement-EnoncePolitique-eng.pdf>.

DFO. 2013*b*. Measures to Avoid Causing Harm to Fish and Fish Habitat. Fisheries and Oceans Canada (DFO). <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>.

DFO. 2014. Science Advice for Managing Risk and Uncertainty in Operational Decisions of the Fisheries Protection Program. Science Advisory Report 2014/015, Department of Fisheries and Oceans Canada.

ECCC. 2017. General Nesting Periods of Migratory Birds in Canada. Environment and Climate Change Canada (ECCC) - General Nesting Periods of Migratory Birds in Canada. Government of Canada. <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1>. Accessed 12 Oct 2017.

Government of BC. 2018. Recreation Sites and Trails BC. <http://www.sitesandtrailsbc.ca/default.aspx?ll=55.1984655992161%2C-123.018836683643&z=12>.

Government of Canada. 2002. Species at Risk Act. S.C. 2002, c. 29. <http://laws-lois.justice.gc.ca/eng/acts/s-15.3/>.

Government of Canada. 2018. Species at Risk Public Registry - General Questions and Answers on SARA Permits. <https://www.sararegistry.gc.ca/default.asp?lang=En&n=EA35A22E-1>. Accessed 24 May 2018.

Holroyd, S. L., and V. S. Craig. 2016. Best Management Practices for Bats in British Columbia, Chapter 4: Wind Power Developments. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10328>.

Hope, G. D., W. R. Mitchell, D. A. Lloyd, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Chapter 10: Interior Douglas-fir Zone. Pages 167–181 *in*. Ecosystems of British Columbia. Special Report Series 6, Ministry of Forests, Victoria, BC.

Klinkenberg, B. 2015. E-Flora BC: Electronic Atlas of the Plants of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. <http://ibis.geog.ubc.ca/biodiversity/eflora/>. Accessed 11 Oct 2015.

Meidinger, D., J. Pojar, and W. L. Harper. 1991. Chapter 14: Sub-boreal spruce zone. Pages 95–111 *in* D. V. Meidinger and J. Pojar, editors. Ecosystems of British Columbia. Special Report Series 6, Ministry of Forests Research Branch, Victoria, BC. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/Srs06.htm>.

MFLNRO. 2012. VRI Relational Data Dictionary (version 4.0) - Draft. <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/data-management/standards/vegcomp_poly_rank1_data_dictionary_draft40.pdf>.

MFLNRO. 2014. Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia. BC Ministry of Forests, Lands and Natural Resource Operations, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf>. Accessed 30 Jun 2014.

MOE & DFO. 2015. Standards and Best Practices for Instream Works: Pipelin Crossings - Version 1.0. <http://www.env.gov.bc.ca/wld/instreamworks/downloads/PipelineCrossings.pdf>.

BC MOE. 2014. Develop with Care 2014: Environmental guidelines for urban and rural land development in British Columbia. B.C. Ministry of Environment, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/>. Accessed 14 Oct 2014.

MOE. 1983. Land capability classification for agriculture in British Columbia. MOE Manual 1, Prepared by B.C. Ministry of Environment, Surveys and Resource Mapping Branch, and B.C. Ministry of Agriculture and Food, Soils Branch, Kelowna, B.C. <http://www.env.gov.bc.ca/wld/documents/techpub/moe1/moem1.pdf>.

MOE. 2004. Terms and Conditions for Changes In and About A Stream Specified by MOE Habitat Officers, Cariboo Region. BC Ministry of Environment. <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/terms_conditions_timing_car.pdf>.

MOE. 2006. British Columbia Approved Water Quality Guidelines 2006 Edition. British Columbia Ministry of Environment (MOE), Victoria, B.C. <http://www2.gov.bc.ca/gov/topic.page?id=044DD64C7E24415D83D07430964113C9>.

MOE. 2007. Oil and Gas Waste Regulation - User's Guide (Draft).

MOE. 2009*a*. A User's Guide to Working In and Around Water - Understanding the Regulation Under British Columbia's Water Act - updated. B.C. Ministry of Environment, Water Stewardship Division. <http://env.gov.bc.ca/wsd/water_rights/cabinet/working_around_water.pdf>.

MOE. 2009*b*. Technical Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing. BC Ministry of Environment. <http://www.env.gov.bc.ca/epd/remediation/guidance/index.htm>.

MOE. 2013. Guidelines for Raptor Conservation During Urban and Rural Land Development in British Columbia. Best Management Practices, B.C. Ministry of Environment. <http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf>. Accessed 15 Aug 2013.

MOE. 2016. Best Management Practices for Bats in British Columbia. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12460>. Accessed 7 Jun 2016.

MOE. 2017. Fisheries Inventory - Fisheries Information Summary System (FISS). Provincial Database created by B.C. Ministry of Environment. <http://www.env.gov.bc.ca/fish/fiss/index.html>.

BC MOFR, and BC MELP. 2010. Field Manual for Describing Terrestrial Ecosystems - 2nd edition. British Columbia Ministry of Forests and Range & British Columbia Ministry of Environment Lands and Parks. Land Management Handbook, Forest Science Program, Victoria, BC. <https://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh25-2.htm>.

MWLAP. 2002. A Field Guide to Fuel Handling, Transportation and Storage. 3rd Edition, BC Ministry of Water, Land and Air Protection and BC Ministry of Forests. <http://www.env.gov.bc.ca/epd/industrial/oil_gas/pdf/fuel_handle_guide.pdf>.

MWLAP. 2004*a*. Identified Wildlife Management Strategy: Procedures for Managing Identified Wildife (Version 2004). BC Ministry of Water, Land and Air Protection.

MWLAP. 2004*b*. Terms and Conditions for Changes In and About A Stream Specified by MWLAP Habitat Officers, Omineca Region. BC Ministry of Water Land and Air Protection. <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/terms_conditions_timing_omineca.pdf>.

Nagorsen, D., M. Brigham,, C. Lausen, and J. Hobbs. 2018. Bats of Britsh Columbia (in Prep). Royal British Columbia Museum.

OGC. 2018. Environmental Protection and Management Guide Version 2.6. <https://www.bcogc.ca/node/5899/download>. Accessed 6 Mar 2018.

OpenStreetMap. 2018. OpenStreetMap Imagery.

PGMap. 2018. PGMap. City of Prince George Online Map. <https://www.princegeorge.ca/City%20Services/Pages/Maps.aspx>.

PRRD and ISCBC. 2013. Best Practices for Managing Invasive Plants on Oil & Gas Operations: A Pocket Guide for British Columbia's Oil and Gas Workers. Invasive Species Council of British Columbia and Peace River Regional District Invasive Plant Committee. <https://bcinvasives.ca/documents/OG-Guide_2013_FINAL.v2.pdf>.

Tera. 2015. FortisBC Energy Inc. / FortisBC Inc. Generic Environmental Management Plan for Works in and about Water. Prepared by Tera, a CH2M Hill Company for FortisBC, February 2015.

Wind, E. M., M. Sarell, N. Sands, and S. Sloboda. 2013. Best Management Practices for Amphibian and Reptile Salvages in British Columbia. Working Draft., Ministry of Forests, Lands, and Natural Resource Operations, Surrey, B.C.

WiTS. 2018. Wildlife Tree Stewardship Atlas. WiTS Wildlife Tree Stewardship. a BC Nature program. <http://www.wildlifetree.ca/about.html>.

WLAP. 2005. Region 7 Omineca _ Reduced Risk Timing Windows for FIsh and Wildlife: Standards and Best Practices for Instream Works. <http://www.env.gov.bc.ca/wld/documents/bmp/omineca_tw_bmp.pdf>.

APPENDIX A
Environmental Worksheets

APPENDIX B
Photographic Log

APPENDIX C

Species of Concern Potential for Occurrence Table

APPENDIX D

Waterbody Summary Table

Environmental Overview Assessment
Thompson-Okanagan Sub-Region

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EXECUTIVE SUMMARY

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and include the replacement of four laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations (PRS) to manage the remaining 14 laterals. The existing 29 laterals are located in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3). This Environmental Overview Assessment (EOA) report presents Project environmental risks associated with Set 2, the Thompson-Okanagan sub-region.

The general study area for this EOA includes the length of the referenced laterals, with a 100 m width on either side of the lateral. A 500-m wide study area was used to assess potential wildlife and species at risk presence during desktop review.

A desktop assessment was completed for each lateral proposed for upgrading. The information gathered in the desktop assessment was used to identify environmental receptors of concern and to focus and refine the scope of preliminary field reconnaissance (PFR) activities undertaken to ground-truth information gathered at the desktop level. Information included in the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Data collection and PFR methods specific to each environmental receptor category are described within this report.

PFR work was undertaken by Hemmera biologists in May and June of 2018. The PFR supported the desktop assessments and gathered biophysical information for the study areas associated with laterals where ILI or pipeline replacement are the preferred engineering options. For laterals where PRS was the preferred option, field data was collected at the location of the proposed PRS station. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 2 laterals in the event additional ILI or replacement activities are required or should additional footprint be required (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active agricultural areas) were not visited during PFR, unless a reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

This report provides a high-level overview of the potential adverse effects to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities (i.e., where the anticipated construction footprint overlaps with identified features), and where factors present a risk to the Project. For the purposes of this report, risks to the Project include additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals). The following table is a summary of the Project risks identified for the Thompson-Okanagan sub-region.

Lateral (Upgrade Options)	Project Risk(s)											
	Preferred Option						Alternative Option					
	Environmental Receptors											
	Land Use	Surface Water Quality and Quantity	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites	Land Use	Surface Water Quality and Quantity	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites
KA1 LTL and LOP 168 (PLR/ILI)	High	Low	Nil	High	High	1 medium risk APEC	High	Low	Nil	Med	High	1 medium risk APEC
SAL LOP 168 (ILI/PLR)	Med	Low	Low	Med	High	No risk areas identified	High	High	High	Med	High	4 low risk, 2 medium, 2 high risk APEC's
SA3 LTL 168 (PLR/ILI)	Med	Low	Low	Low	Med	1 low risk, 2 high risk APEC's	Low	Nil	Nil	Low	Low	, 2 high risk APEC's
COL LOP 168 (PRS/ILI)	Low	Low	Med	Low	Med	1 high risk APEC	Med	Low	Med	Med	High	1 low risk, 1 medium risk, 1 high risk APEC
COL LTL 219 (PRS/ILI)	Low	Low	Med	Low	Med	1 medium risk, 1 high risk APEC	Med	Med	Med	Low	High	1 low risk, 2 medium risk, 1 high risk APEC
KE1 LOP 219 (PRS/ILI)	Low	Nil	Nil	Nil	Low	1 medium risk, 1 high risk APEC	High	Med	Med	Med	High	4 low risk, 1 medium risk, 1 high risk APEC

This Executive Summary is not intended to be a stand-alone document, but a summary of findings as described in the following report. It is intended to be used in conjunction with the scope of services and limitations described therein.

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APPENDICES

Appendix A Environmental Worksheets
Appendix B Photographic Log
Appendix C Species of Concern Potential for Occurrence Table
Appendix D Waterbody Summary Table

This work was performed in accordance with Blanket Order Number: 4500052346 between Hemmera Envirochem Inc. (“Hemmera”) and FortisBC Energy Inc. (“Client”), dated March 13, 2018 (“Contract”) as well as the Inland Gas Upgrade Project – Change Order to Address Revisions to Upgrade Priorities, dated October 3, 2018.This report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by insert client name. In performing this work, Hemmera has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

1.0 INTRODUCTION

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and includes the replacement of 4 laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations to manage the remaining 14 laterals. The existing 29 laterals are located in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3). Hemmera Envirochem Inc. (Hemmera) was retained by FortisBC to prepare high level Environmental Overview Assessment (EOA) reports for the Project. This EOA report presents a description of the existing environment and the environmental risks associated with Set 2, the Thompson-Okanagan sub-region.

To proceed, FortisBC requires a Certificate of Public Convenience and Necessity (CPCN) from the British Columbia Utilities Commission (BCUC) as per section 45(1) and 46(1) of the *Utilities Commission Act*. This Environmental Overview Assessment (EOA) report will be used by FortisBC in support of the CPCN application.

The content of the EOA reports are intended to meet the CPCN application guidelines (BCUC 2015). As such, this report identifies environmental receptors in or adjacent to the expected footprint of the Project, potential impacts to those receptors, and environmental risks to be addressed or mitigated prior to and/or during construction (and in some cases post-construction). Most of these risks carry Project cost and schedule implications. The report provides an overview of five main environmental receptor categories:

1. Land use
2. Contaminated sites (water and soil)
3. Fish and fish habitat
4. Vegetation (including invasive plants)
5. Wildlife

Species at risk are addressed within the fish, vegetation and wildlife assessments.

1.1 Project Scope and Area

FortisBC identified preferred and alternative engineering options for each lateral. The Set 2 laterals and the associated preferred and alternative engineering options are listed in **Table 1.1**. The location of each lateral and anticipated construction footprints are shown in the Environmental Worksheets (**Appendix A**). The engineering options are as described:

- Pipeline replacement (PLR): The construction footprint is expected to be 30 m wide for the length of the pipeline. Pipeline replacement activities include:
  - Installation of a new pipeline in parallel with the existing pipeline
  - Deactivation and abandonment in place of the old line

- In-line inspection (ILI): The estimated construction footprint for each area of disturbance is expected to range from 50 square meters (m^2) to 500 m^2 depending on the associated activity. ILI upgrade activities include:
  - Installation of pig barrels at each end of the pipeline to allow ILI tools to be launched and received
  - Installation of control valve assembly stations
  - Replacement of non-ILI compatible sections and features such as bends, valves, tees, and stopple fittings
- Pressure regulating station (PRS): The construction footprint will be between 1000 m^2 and 2000 m^2, and includes:
  - Installation of a pressure reducing station at the start of the lateral

Table 1.1 Thompson-Okanagan ILI Lateral/Loop Summary

Full Name	Abbreviation	Length (km)	Preferred Option	Alternative Option
KAMLOOPS 1 LATERAL 168	KA1 LTL 168	3.6	PLR	ILI
KAMLOOPS 1 LOOP 168	KA1 LOP 168	3.1	PLR	ILI
SALMON ARM LOOP 168	SAL LOP 168	44.9	ILI	PLR
SALMON ARM 3 LATERAL	SA3 LTL 168	0.8	PLR	ILI
COLDSTREAM LAT 219	COL LTL 219	1.8	PRS	ILI
COLDSTREAM LOOP 168	COL LOP 168	3.8	PRS	ILI
KELOWNA 1 LOOP 219	KE1 LOP 219	2.1	PRS	ILI

Note: ILI = In-line Investigations; PLR = Pipeline Replacement; PRS = Pressure Regulating Stations

Anticipated construction activities associated with the Project construction phase are outlined below:

- Site preparation:
  - Mobilization and demobilization of construction equipment and materials
  - Storage of construction equipment and materials
  - Development of temporary and permanent workspaces
  - Right of Way (ROW) clearing and widening (vegetation clearing and grubbing)
- Trench, pit, or site excavation:
  - Removal of asphalt
  - Stripping of topsoil
  - Site grading
  - Trench excavation
  - Stream crossings including trenchless (horizontal directional drilling (HDD)) or open-cut crossing methods.
- Material stockpiling and disposal:
  - Stockpiling and potential disposal of excavated materials
- Pipe/features installation/ PRS construction and hydrostatic testing:
  - Installation of pipe or pipeline main features

    - Construction of PRS
    - Potential concrete pouring
    - Capping and filling of installed sections of pipes with hydrostatic test water
        - Water may be drawn from municipal sources or potentially from nearby natural water sources
        - Disposal/discharge of hydrostatic test water
- Water quality and quantity management
    - Pumping and discharge of groundwater encountered during excavation (or from surface water sources)
    - Treatment of contaminated or sediment-laden water prior to discharge to aquatic habitat
- Landscape restoration
    - Grading and smoothing of ground surface
    - Placement of topsoil
    - Hydroseeding or replanting of groundcover
    - Potential instream and riparian habitat restoration
- Maintenance and Operations
    - Invasive vegetation management

2.0 METHODS

The general study area for this EOA includes the length of the referenced laterals as outlined in **Table 1.1**, with a 100 m width on either side of the lateral. This 100 m study area facilitates gathering sufficient information to meet OGC requirements, which will be important for the future permitting phase of the Project. A 500-m buffer was used to determine known wildlife and species at risk use and to assess their potential presence during desktop review.

A desktop assessment was completed for each lateral (**Section 3.0**). Information gathered during the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Information sources used in the desktop assessment are listed in **Table 2.1**. The information gathered in the desktop assessment was used to identify potential risks associated with each of the environmental receptors and to focus and refine the scope of Preliminary Field Reconnaissance (PFR) undertaken to ground-truth the information gathered during the desktop assessment. Data collection and PFR methods specific to each environmental receptor category are described in the sub-sections below.

Table 2.1 Desktop Information Sources

Data Source	Information Reviewed	Data Access Date
Federal		
Species at Risk Public Registry (SARA)	Review of federally listed species risk with identified critical habitat not included in the critical habitat spatial data available from DataBC (i.e., species with recovery strategies posted after August 2017)	April 2018
Environment and Climate Change Canada (ECCC)	Critical habitat for snake species (spatial data not yet available through BC Data Catalogue)	April 2018
Committee of the Status of Endangered Wildlife in Canada (COSEWIC)	Assessment Reports (range and habitat requirements) of species of concern identified with potential to occur within study area	March – April 2018
Federal Contaminated Sites Registry	All known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment	April – June 2018
Provincial		
BC Conservation Data Centre (BC CDC)	Data provided for masked (i.e., confidential) species at risk occurrences within the study area	

Data Source	Information Reviewed	Data Access Date
BC Data Catalogue	Agricultural capability mapping Agricultural Land Reserve (ALR) boundary Biogeoclimatic Ecosystem Classification (BEC) map CDC element occurrences – (masked/sensitive and public occurrences) Community Watersheds – current Critical habitat for federally-listed species at risk (posted) Freshwater Atlas (man-made waterbodies, rivers, stream network and lines, wetlands); Invasive Alien Plant Site (i.e., known locations of noxious weeds) Known BC fish observations Municipal boundaries Old Growth Management Areas Parcel Map BC Parcel Fabric (to determine lot boundaries and land ownership) Parks and Protected Areas Roads Ungulate Winter Range (approved) Vegetation Resource Inventory (VRI) - forest vegetation composite polygons and Rank 1 layer (review of age class to determine presence of old growth forest) Wildlife Habitat Areas (approved) Wildlife Management Areas (approved)	February – April 2018
BC Weed Control Regulation	Review of provincially and regionally designated noxious weeds	March 2018
BC Site Registry	The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*.	April – June 2018
Regional/Municipal		
Cities of Armstrong, Salmon-Arm, District of Coldstream, Township of Spallumcheen	Online map applications where available Review of potentially applicable municipal by-laws	March 2018
City of Vernon	Ortho-imagery Review of potentially applicable municipal by-laws	2018
City of Kelowna	Ortho-imagery Sensitive Habitat Inventory Mapping (SHIM) data (streamline, culvert, modification, discharge, obstruction, top of bank, fish habitat) Review of potentially applicable municipal by-laws	2015
City of Kamloops	Open Data related to waterbodies (drainage, hydrography) Review of potentially applicable municipal by-laws	March 2018
Regional Districts of Central Okanagan, Columbia Shuswap, North Okanagan, Thompson-Nicola	Online map applications where available Review of potentially applicable municipal by-laws	March 2018

Data Source	Information Reviewed	Data Access Date
Other		
Hemmera's Species at Risk Technical Expert	Personal database (compilation of occurrence and observation records) of Species at Risk occurrences within BC	April 2018
FortisBC	Lateral alignment	March 23, 2108
	Lateral details (including locations of bends, valves, tees, stopples, etc.)	April 30, 2018
Bing, ESRI, Google	Ortho-imagery	February – April 2018
eFlora and eFauna	Atlas pages (range and habitat requirements) of species at risk identified to have potential to occur within study area	April – June 2018
Stantec (via FortisBC)	Construction details of Pressure Regulation Sites	May 14, 2018
Wildlife Tree Stewardship Atlas (WiTs)	Review of the bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) nest registry	April 2018
BirdLife International	Important Bird Area Maps	April 2018
Nature Trust British Columbia Properties Web App	Properties owned by the Nature Trust of British Columbia	March 2018
Ecolog ERIS Report	Search of 49 environmental databases	April – June 2018
UBC Geographic Information Centre	Historical aerial photographs	April – June 2018

PFR work was undertaken by Hemmera biologists in May and June of 2018. The PFR supported the desktop assessments and gathered additional biophysical information for the study areas associated with laterals where ILI or PLR are the preferred engineering options. For laterals where PRS was the preferred option, field data was only collected at the end of the lateral where the proposed PRS would be constructed. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 2 laterals in the event additional ILI or replacement activities are required or should additional footprint be required (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active agricultural areas) were not visited during PFR, unless a reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

The dates and areas assessed during PFR are outlined below:

- KA1 LTL 168 and KA1 LOP 168: May 22, 2018- Entire lateral alignment was assessed on foot from south to north
- SAL LOP 168: May 23, 24, 30, 31, and June 1, 2018- Key areas along the lateral alignment were accessed by combination of vehicle/foot access
- SA3 LTL 168: June 1, 2018- Entire lateral alignment was assessed on foot from south to north using a vehicle for initial access

- COL LTL 219: May 23, 2018 – The PRS site and both ends of the lateral were assessed on foot using a vehicle for initial access
- COL LOP 168: May 23, 2018 – The PRS site and both ends of lateral were assessed on foot using a vehicle for initial access
- KE1 LOP 219: May 23, 2018 - May 23, 2018 – The PRS site and both ends of lateral were assessed on foot using a vehicle for initial access

Representative photos were taken at environmental points of interest (e.g., watercourses, wildlife features, vegetation features) and at regular reference points (i.e., approximately every 200 m where access permitted). Select photos of key features are provided in a photo log (**Appendix B**). Additional reference photos are available upon request.

2.1 Land Use

Land use resources from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- General ownership of land within the study area (e.g., federal, provincial crown, municipal, private)
- Regional districts and municipalities overlapped by the study area
- Parks and protected areas within the study area
- ALR areas overlapped by the study area and the number of properties within the ALR intersected by the lateral
- Agricultural land capability classification of soils within the ALR (classes range from 1 to 7, with Class 1 land being capable of producing a wide range of crops on deep, well-drained, level soils, to Class 7 land with no capability for agriculture, such as bedrock and non-soil areas (MOE 1983))

During PFR, any areas where land use was observed to be different from the aerial imagery used for mapping and desktop analysis was recorded and geographically referenced.

2.2 Contaminated Sites (Water and Soil)

A desktop assessment was completed for each of the laterals to identify APECs where contaminated soil and groundwater may be encountered during the proposed construction activities. To identify APECs, Ecolog ERIS reports and current and historical aerial photographs were reviewed to identify potentially contaminated sites. Subsequently, site visits were completed as part of PFR activities, focusing on suspect sites where past/present land use and operations were indeterminable through review of historical photographs and record searches.

The Ecolog ERIS reports included a search of 49 environmental databases for record entries within 250 m of the laterals, of which the most relevant are the following:

- Authorization Management System (formerly WASTE)
- BC Ministry of the Environment and Climate Change Strategy (MOE) Online Site Registry
- Chemical Register
- Environmental Issues Inventory System

- Federal Contaminated Sites Inventory (FCSI)
- National Environmental Emergencies System
- National PCB Inventory (federal) and Inventory of PCB Storage Sites (provincial)
- National Pollutant Release Inventory (NPRI)
- Oil and Gas Wells
- Retail Fuel Storage Tanks
- Scott's Manufacturing Directory
- Special Waste Information System
- Waste Disposal Site Inventory
- Waste Generators Summary
- Waste Receivers Summary
- Wastewater Discharge Inventory

The primary databases relied on for identifying known and potentially contaminated sites were the BC MOE Online Site Registry and the FCSI. The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*. Where Site Registry results were identified within 50 m of the laterals, Detailed Registry Reports were requested to provide additional information. The FCSI includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated crown corporations, as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility.

Historical aerial photographs sourced from Natural Resources Canada's National Air Photo Library, were requested through Ecolog ERIS and reviewed to identify operations that were potential APECs. Where significant gaps were present in the years of available aerial photos, or the quality of available aerial photos was poor, supplemental aerials were requested from the University of British Columbia Geographic Information Centre. Each of the laterals were also reviewed using current and historical aerial and street view photography available in Google Earth.

Where site visits were completed, the existing lateral alignments and adjacent properties were assessed for potentially contaminating operations (e.g., auto repair, manufacturing, gas stations, industrial operations, etc.), evidence of underground or above ground storage tanks (UST or AST), waste dumping or landfilling, previous environmental investigations (e.g., groundwater monitoring wells) and storage of hazardous materials. The results of the site visits were then cross-referenced with the information gathered during the desktop assessment to determine which areas constitute APECs. Each of the identified APECs were then assigned a risk-ranking of low, medium or high, based on the likelihood of the operation having caused contamination in soil or groundwater within or near the existing lateral alignment. The factors considered when determining the likelihood included:

- Type and mobility of potential contaminants (metals vs hydrocarbons, etc.)
- Geographic location of the site or operation (downgradient vs upgradient)
- Age of potentially contaminating operations (older operations increase likelihood)

- Sophistication of operation (likelihood to have environmental policies)

When assigning a risk-ranking, the scale of the operations, distance from the lateral, the local topography and inferred groundwater flow direction, and the source and mobility of PCOCs were considered. The risk rankings can be further described as follows:

- Low-risk – Potentially contaminating operations were identified but are unlikely to have resulted in contamination within the Project alignment. Additional assessment work is not recommended to characterize the risk associated with each of the low-risk sites and there is not expected to be a cost for site management during Project construction. Should unexpected impacts be identified during the Project related to low risk areas, appropriate investigation and management activities would be assessed and completed at that time
- Medium-risk - Potentially contaminating operations were identified that are likely to have resulted in some level of contamination within a portion of the Project alignment; although, the nature of the concern and proximity/location of the site may limit the overall liability during the construction phase. Further assessment is recommended to characterize the risk within each of the medium-risk APECs and there is expected to be a cost for site management during Project construction
- High-risk – Operations with significant potential for contamination or confirmed contaminated sites that are likely to have resulted in contamination within the majority of the Project alignment and further work would be required to determine the extent of the potential liability. Further assessment work is recommended to define the risk associated with each of the high-risk sites and there is expected to be a cost for site management during Project construction

A summary of the findings of the desktop assessment for each lateral is provided in **Section 3.0**, and the APECs and affected segments of the lateral alignments are presented on **Figures TO-2** to **TO-39**.

2.3 Fish Habitat

For the purposes of this report, fish habitat assessment includes all permanent and intermittent waterbodies and associated riparian vegetation within the 100 m study area. A desktop review was conducted to obtain existing data on fish and fish habitat prior to PFR. Data was compiled from the following sources:

- Fisheries Information Summary System (MOE 2017*a*)
- BC Species and Ecosystem Explorer (BC CDC 2018)
- COSEWIC (Government of Canada 2018)
- Aquatic Species at Risk online database (DFO 2018)
- HabitatWizard, iMapBC, and Freshwater Atlas (FWA) online mapping databases (DataBC 2018)
- Municipal and regional district online map data, where available

Species-specific details on their range, habitat requirements and their assessed potential to occur are provided in **Appendix C**. **Table 2.1** provides a list of information sources that were queried during this process. A search for known occurrences of fish species of concern, and species with federally-designated critical habitat within the study area was conducted within the study area for each lateral. For the purposes of this report, fish species of concern were defined as species that are listed under federal SARA, species afforded protection by the BC *Wildlife Act* (WA) and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline

(2018)). The expanded 500 m study area was used for assessing potential presence of fish species of concern. The list of at-risk species was further refined based on their current known range and habitat suitability for each species assessed during the desktop studies and based on information gathered during PFR. Each species was then ranked according to it's potential to occur within the study area (i.e., nil, low, medium, or high[1]).

Fish species of concern that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report. Watercourse classification varies between regions and municipalities. Riparian setbacks for watercourses were calculated based on the applicable legislation within each municipality (e.g., Riparian Area Regulation (RAR) as enacted under the Riparian Area Protection Act (RAPA)). Outside of municipal boundaries, the *Forest and Range Protection Act* (FRPA) stream classification model was used. Streamside Protection and Enhancement Areas (SPEA) were calculated for watercourses within municipalities that follow RAR (**Table 2.2**) and Riparian Management Areas (RMA) were calculated for watercourses within all other areas (**Table 2.3**).

During PFR activities, streams intersecting the study area were generally accessed by foot or vehicle on existing road infrastructure. Biophysical measurements (e.g., stream width, depth, gradient, and substrate type) were collected for each watercourse where it crossed the lateral, or at the nearest accessible location of select watercourses where lateral crossings were not accessible to field crews. obstructions to fish passage, unique channel characteristics (e.g., flood channels, braids, secondary channels, wetlands, bogs, depressions, etc.), and any other notable habitat features were also identified and recorded. Active fish sampling within the watercourses was not conducted during PFR activities. Where fish presence was unknown, the stream was conservatively classified as fish-bearing.

Table 2.2 SPEA Widths for Simple Assessment (RAR)

Vegetation Category	Existing or Potential Streamside Vegetation Conditions	SPEA Width		
		Fish Bearing	**Non-fish Bearing**	
			Permanent	**Non-permanent**
1 (> 15 m)	Continuous areas ≥ 30 m or discontinuous but occasionally > 30 m to 50 m	30 m	30 m	15 – 30 m
2 (10 – 15 m)	Narrow but continuous area = 15 m or discontinuous but occasionally > 15 m to 30 m	15 – 30 m	15 m	15 m
3 (< 10 m)	Very narrow but continuous areas up to 5 m or discontinuous but occasionally > 5 m to 15 m	15 m	5 – 15 m	5 – 15 m

Adapted from Riparian Area Regulation Assessment Methods (2006).

[1] **Nil**: current understanding of the species' range and/or known species habitat associations suggests the species is not expected to occur within the study area – presence would be considered accidental. **Low**: current understanding of the species' range and/or known species habitat associations suggests the species is unlikely to occur within the study area with regularity or in adequate density to facilitate a functional population. Several ecological life-requisite stages would be challenged based on existing habitat conditions in the study area and/or connectivity with larger, more contiguous occurrence of the species. **Medium:** current understanding of the species range and/or known species habitat associations suggests that the species is expected to occur in the study area on a temporary or regular (i.e., predictable) seasonal basis and in densities that facilitate persistence of a functional population within the study area. **High:** current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the study area regularly, and in densities that would be expected to occur in provincial benchmark habitats.

Table 2.3 RMA Widths (FRPA)

Stream Riparian Classification Table		
Average Channel Width	Riparian Class	Riparian Management Area (m)
Fish-bearing		
≥ 100 m (stream or active flood plain width)	S1A	100
> 20 m	S1B	70
5 – 20 m	S2	50
1.5 – < 5 m	S3	40
< 1.5 m	S4	30
Non fish-bearing		
> 3 m	S5	30
≤3 m	S6	20

Adapted from the Forest and Range Practices Act: Forest Planning and Practices Regulation (2004).

2.4 Vegetation

Vegetation resources from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- BEC zones and subzones
- Areas of forest cover and dominant tree species (through analysis of aerial imagery and VRI polygons)
- Areas of old growth forest stands. For the purposes of this report, old growth was defined as:
  - Approved old growth management areas (OGMAs)
  - Stands with leading species with a projected age class of 8 or 9, depending on the Natural Disturbance Type of the BEC unit they were found in (BC MOFR and BC MELP 2010)
- Federally identified critical habitat for plant species at risk
- Known locations of invasive plants

Plant species and ecological communities of concern with the potential to occur in the study area for each lateral were also identified. For the purposes of this report, species and ecological communities of concern were defined as species that are listed under SARA and species that are included in the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)).

To determine the potential presence of species and ecological communities of concern, a query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify plant species and ecological communities that are known to occur in the BEC zones (species) and subzones (communities) that overlap with the 100 m study area for each lateral. The list of species was further refined based on the range and habitat suitability of each species and information collected during PFR. Species were ranked according to their potential to occur in the study area (i.e., nil, low, medium, or high).

Species-specific details on range, habitat requirements and their assessed potential to occur is provided in **Appendix C**. Species that were determined to have a medium or high potential for occurrence within

the study area are presented in the body of this report. Information regarding ecological communities is generally less-available than for individual species; therefore, ecological communities were not ranked according to potential for occurrence. All ecological communities identified within a BEC subzone that overlaps with the study area for a particular lateral were included within the report.

PFR activities collected data on vegetation community assemblage along the laterals. Areas of invasive or noxious weeds within or immediately adjacent to the ROW were recorded and geographically referenced. Areas of unique habitats encountered along the ROW that were considered to have potential to support at-risk plant species (e.g., areas of old growth forest, wetlands, rocky outcrops and seeps) were recorded and geographically referenced.

2.5 Wildlife

Wildlife values from **Table 2.1** were reviewed within an expanded 500-m study area for each lateral. This expanded study area was used to provide a conservative zone to identify recorded occurrences of species at risk, especially mobile species (such as birds). Desktop studies identified the following designations and features when they occurred within the study area for each lateral:

- Important Bird Areas
- Approved Wildlife Habitat Areas (WHAs)2
- Wildlife Management Areas (WMAs)
- Approved Ungulate Winter Ranges (UWRs)
- Previously mapped locations of osprey and bald eagle nests
- Federally identified critical habitat for species at risk

Wildlife species of concern with the potential to occur in the study area, for each lateral were also identified. For the purposes of this report, wildlife species of concern were defined as species that are listed under federal SARA, species whose nests are afforded protection by section 34b of the BC *Wildlife Act* (WA) and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)). A query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify wildlife species known to occur in the BEC zones and subzones that overlap with the 500 m wildlife study area applied to each lateral (or loop). The list of species was further refined based on the current known range and habitat suitability for each species assessed during the desktop studies (see **Table 2.1** for a list of information sources that were queried during this process) and based on information gathered during field assessment to rank each species according to its potential to occur within the study area for each alignment (i.e., nil, low, medium, or high) (see **Appendix C** for species-specific details on range and habitat requirements and their assessed potential to occur). Species that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report for each lateral or loop.

During the PFR, observations of wildlife of concern and wildlife habitat features (e.g., raptor or heron nests, bird colonies, mineral licks, wallows, dens, burrows, and wildlife trees, etc.) were recorded, described and geographically referenced. Activity, behaviour and species abundance, where evident and relevant, was also noted.

[2] Proposed WHAs were not included as a consideration as management afforded to proposed WHAs is restricted to conservation of the wildlife habitat feature within each WHA. Where interim measures are required to ensure protection of a wildlife habitat feature within a proposed WHA the BC MFLNRORD is responsible for providing written notification to all affected parties, of the location and protection allotted to the wildlife habitat feature during the consultation phase of WHA designation. The request will solicit voluntary protection consistent with the candidate general wildlife measures. If no such request has been advanced there is no requirement for interim protection ((MWLAP 2004))

3.0 OVERVIEW OF EXISTING ENVIRONMENT

A description of the existing conditions related to each of the five environmental receptor categories is provided in the following sub-sections for each lateral in Set 2. Information collected during the desktop assessment and the PFR surveys is summarized below. Pertinent spatial environmental data (e.g., waterbodies, land use zoning, areas of potential environmental concern) is presented on a set of Environmental Worksheets prepared for each lateral in **Appendix A**.

3.1 KA1 LTL 168 and KA1 LOP 168

For the purposes of this report, the KA1 LTL 168 and KA1 LOP 168 were assessed together. KA1 LTL 168 is 3.6 km, and KA1 LOP 168 parallels the southernmost 3.1 km of KA1 LTL 168. Maps pertaining to this lateral are located on **Figures TO-02** to **TO-03** (**Appendix A**).

On May 22, 2018 the lateral was traversed on foot, with access from the Kenna Cartwright Park entrance off Hillside Drive. The PFR started at the FortisBC station and headed north through the park. The local ecology within the park generally consisted of bunchgrass grassland habitat with one small isolated stand of mature coniferous trees (**Section 3.1.4**). The lateral parallels a BC Hydro ROW; active pole removal/replacement was ongoing at the time of assessment. There were several walking trails near the southern two thirds of the lateral. The northern section was steep and uneven terrain with no trails present.

Reference photos were taken approximately every 200 m. Public activity within the study area was limited to use of exiting park trail networks (**Section 3.1.1**).

An overview of the identified environmental receptors within the study area is provided in Sections **3.1.1** to **3.1.5**.

3.1.1 Land Use

Both laterals are in an approximately north to south direction in Kenna Cartwright Nature Park in western Kamloops. The north end of the KA1 LTL 168 is located approximately 30 m south of CN railway tracks, and approximately 100 m south of Domtar Pulp Mill. A summary of the land use within the study area is provided in **Table 3.1**.

Table 3.1 Overview of Land Use within the KA1 LTL 168 and KA1 LOP 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency: 0.2 **Municipal**: 59.8 **Private**: 11.6 **None**:0.2 **Unknown**:0.3	Thompson-Nicola	Kamloops	The lateral runs through Kenna Cartwright Nature Park- a large municipal park, part of which is designated as a Grassland Priority Area by the City of Kamloops (City of Kamloops 2017, Kamloopstrails.net 2018). The lateral is crossed in several locations by hiking and biking trails The study area also overlaps with Dufferin Park a small neighborhood park located off of Hillside Drive, that has picnic areas and tennis courts (City of Kamloops 2018)	-	N/A	N/A

3.1.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the KA1 LTL 168 and KA1 LOP 168 laterals are provided in **Table 3.2** and **Table 3.3**.

Table 3.2 Summary of Areas of Potential Environmental Concern for Lateral KA1 LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
KA1 LTL 168 (PLR)							
M1	BC Hydro transformer station (Meadow Road, Kamloops, BC)	BTEX/VPH, EPH, PAHs, PCBs, metals	Aerial imagery	70	Medium	50	TO-03

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

Table 3.3 Summary of Areas of Potential Environmental Concern for Lateral KA1 LOP 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
KA1 LOP 168 (PLR)							
No APECs Identified							

Notes: PCOCs – Potential Contaminants of Concern

3.1.3 Fish and Fish Habitat

During the desktop assessment, five watercourses were identified from the FWA along the KA1 LTL 168 and KA1 LOP 168 study area; however, they were not mapped as watercourses on Kamloops CityMap (Kamloops' online mapping database). During PFR activities, all five of the FWA mapped watercourses were observed to be dry gullies with no defined channel. A higher density of lush vegetation was observed at the bottom of each gully (relative to the surrounding landscape), indicating groundwater or runoff may accumulate at the base of the gully slopes; however, lack of evidence of scour suggests the gullies do not currently convey flow on a seasonal basis and do not meet the classification of a stream[3]. Two additional water features were identified during the PFR: a culvert inlet presumably connected to the stormwater system, and an excavated drainage swale (approximately 75 m long) that leads to another culvert inlet. Both are man-made drainage features, had no evidence of scour and were also determined to not meet the definition of a stream. Each of the drainage features was dry at the time of assessment. Waterbodies are summarized in **Table 3.4** and biophysical descriptions are provided in **Appendix D**.

The City of Kamloops has adopted the RAR setback model (i.e., SPEA) into their development permit area bylaw. A development permit is required for all activities proposed to occur within 30 m of a stream. Based on desktop studies and PFR, no streams are within the 100 m study area; therefore, there are no riparian setbacks present.

Table 3.4 Summary of Waterbodies within the KA1 LTL 168 and KA1 LOP 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_KA1 LTL 168_001	NSCI	0	N/A	Yes: FWA No: Kamloops CityMap	N/A	TO-03
TO_KA1 LTL 168_002	NSCI	0	N/A	Yes: FWA No: Kamloops CityMap	N/A	TO-03
TO_KA1 LTL 168_003	NSCI	22	N/A	Yes: FWA No: Kamloops CityMap	N/A	TO-03
TO_KA1 LTL 168_004	NSCI	43	N/A	Yes: FWA No: Kamloops CityMap	N/A	TO-03
TO_KA1 LTL 168_005	NSCI	75	N/A	Yes: FWA No: Kamloops CityMap	N/A	TO-02 TO-03
TO_KA1 LTL 168_006	Culvert	2	N/A	No	N/A	TO-02
TO_KA1 LTL 168_007	NCD	50	N/A	No	N/A	TO-02

NSCI = no stream channel identified; NCD= Non-classified drainage; N/A = not applicable; FWA = Freshwater Atlas
1 Calculated from a Simple Assessment.

3 *Riparian Area Protection Act*: Stream includes any of the following that provides fish habitat: (a) a watercourse, whether it usually contains water or not; (b) a pond, lake, river, creek or brook; (c) a ditch, spring or wetland that is connected by surface flow to something referred to in paragraph (a) or (b).
Water Sustainability Act: Stream means (a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the stream channel of the stream has been modified, or (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer.
BC Oil and Gas Activities Act: Stream is a natural watercourse or source of water supply, whether usually containing water or not, and lake, river, creek, spring, ravine, swamp and gulch.

3.1.4 Vegetation

The KA1 LTL 168 and KA1 LOP 168 study areas are located within the transition zone between Ponderosa Pine Very Dry Hot (PPxh) and Bunchgrass Very Dry Hot (BGxh) subzones. At the southern end, approximately 2.2 km of both laterals are within the PPxh subzone, which occurs at low elevations along very dry valleys of the southern Interior Plateau of BC, and is typically dominated by ponderosa pine (*Pinus ponderosa*) canopy and an understory of bluebunch wheatgrass (*Agropyron spicatum*) (Hope, Lloyd, et al. 1991). The northern-most 1.2 km of KA1 LTL 168 and 0.7 km of KA1 LOP 168 are located within the BGxh subzone, which dominates lower elevations of major southern interior valleys of BC and is characterized by widely spaced bunchgrasses and biological soil crusts (Nicholson et al. 1991). Except for cleared utility ROWs within the study area, vegetation within the study area was generally undisturbed, and included grassland and mature forest (i.e., age classes 6 to 7), dominated by ponderosa pine and interior Douglas-fir (*Pseudotsuga menziesii var. glauca)*, with an understory of sagebrush (*Artemisia spp*), and grasses. No provincial approved OGMAs or areas of old growth forest were identified in the study area at the desktop level; however, a stand of notably more mature Douglas-fir was observed during the PFR on the left side of the laterals near chainage 1+20 (**Figure TO-02; Feature ID V001**).

Approximately 6.9 ha of invasive vegetation (comprised of five species and distributed over ten sites) was identified in the study area during the desktop search, particularly in the southern portion of the study area (see **Table 3.5** and **Figures TO-02** to **TO-03**). No additional invasive plants were identified during the PFR.

Table 3.5 Invasive Vegetation Identified within the KA1 LTL 168 and KA1 LOP 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Dalmatian toadflax	*Linaria dalmatica*	DK	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DT	Noxious (Provincially)
Knapweed species	*Centaurea spp.*	KS	Noxious (Provincially)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		5
	Number of Sites		10
	Total Area (m^2)		68,866

At-risk plants and plant communities may occur within the study area. Desktop studies identified six plant species of concern with medium or high potential to occur within the study area 48 at-risk ecological communities that occur within the BEC subzones overlapped by the study area (**Table 3.6**). None of these species or ecological communities have known occurrences or federally designated critical habitat polygons within the study area (DataBC 2018).

Table 3.6 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the KA1 LTL and KA1 LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Silvery lupine	*Lupinus argenteus* var. *laxiflorus*	-	-	Red	Yes	Medium
Toothcup	*Rotala ramosior*	1-E (Jun 2003)	E (Nov 2014)	Red	Yes	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Columbian carpet moss	*Bryoerythrophyllum columbianum*	1-SC (Jul 2005)	SC (Nov 2014)	Blue	Yes	Medium
Nugget moss	*Microbryum vlassovii*	1-E (Mar 2009)	E (Nov 2016)	Red	Yes	Medium
Rusty cord-moss	*Entosthodon rubiginosus*	1-E (Aug 2006)	SC (Apr 2017)	Blue	Yes	Medium
Ecological communities						
Big sagebrush / bluebunch wheatgrass	*Artemisia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Big sagebrush / bluebunch wheatgrass - sand dropseed	*Artemisia tridentata / Pseudoroegneria spicata - Sporobolus cryptandrus*	-	-	Blue	Yes	X
Threetip sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tripartita / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Scrub birch - northern gooseberry	*Betula nana - Ribes oxyacanthoides*	-	-	Red	Yes	X
Water birch / roses	*Betula occidentalis / Rosa spp.*	-	-	Red	Yes	X
Seacoast bulrush alkali marsh	*Bolboschoenus maritimus var. paludosus Alkali Marsh*	-	-	Red	Yes	X
Woolly sedge - arctic rush	*Carex pellita - Juncus arcticus*	-	-	Red	Yes	X
Alkali saltgrass herbaceous vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia spp.*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Needle-and-thread grass - prairie sagewort	*Hesperostipa comata - Artemisia frigida*	-	-	Blue	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X
Rocky mountain juniper - big sagebrush / bluebunch wheatgrass	*Juniperus scopulorum - Artemisia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Ponderosa pine / red three-awn	*Pinus ponderosa / Aristida purpurea var. longiseta*	-	-	Blue	Yes	X
Ponderosa pine - black cottonwood / poison ivy	*Pinus ponderosa - Populus trichocarpa / Toxicodendron rydbergii*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass	*Pinus ponderosa / Pseudoroegneria spicata*	-	-	Blue	Yes	X
Ponderosa pine / bluebunch wheatgrass - rough fescue	*Pinus ponderosa / Pseudoroegneria spicata - Festuca campestris*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass - Idaho fescue	*Pinus ponderosa / Pseudoroegneria spicata - Festuca idahoensis*	-	-	Blue	Yes	X
Ponderosa pine / bluebunch wheatgrass - silky lupine	*Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus*	-	-	Red	Yes	X
Ponderosa pine / smooth sumac	*Pinus ponderosa / Rhus glabra*	-	-	Red	Yes	X
Ponderosa pine / common snowberry / bluegrasses	*Pinus ponderosa / Symphoricarpos albus / Poa spp.*	-	-	Red	Yes	X
Trembling aspen - black cottonwood / common snowberry / common horsetail	*Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense*	-	-	Red	Yes	X
Trembling aspen / common snowberry /	*Populus tremuloides / Symphoricarpos*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Kentucky bluegrass	*albus / Poa pratensis*					
Black cottonwood - water birch	*Populus trichocarpa - Betula occidentalis*	-	-	Red	Yes	X
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - red-osier dogwood	*Populus trichocarpa / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir - water birch / Douglas maple	*Pseudotsuga menziesii - Betula occidentalis / Acer glabrum*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / mallow ninebark	*Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus*	-	-	Red	Yes	X
Douglas-fir / bluebunch wheatgrass / step moss	*Pseudotsuga menziesii / Pseudoroegneria spicata / Hylocomium splendens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry - saskatoon	*Pseudotsuga menziesii / Symphoricarpos albus - Amelanchier alnifolia*	-	-	Red	Yes	X
Douglas-fir / common snowberry / pinegrass	*Pseudotsuga menziesii / Symphoricarpos albus / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	-	-	Blue	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / needle-and-thread	*Purshia tridentata / Hesperostipa comata*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
grass						
Narrow-leaf willow - peach-leaf willow	*Salix exigua - Salix amygdaloides*	-	-	Red	Yes	X
Narrow-leaf willow shrubland	*Salix exigua Shrubland*	-	-	Red	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Long-awned three-square bulrush alkali marsh	*Schoenoplectus pungens var. longispicatus*	-	-	Red	Yes	X
Compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	*Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora*	-	-	Blue	Yes	X
Sand dropseed - needle-and-thread grass	*Sporobolus cryptandrus - Hesperostipa comata*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail marsh	*Typha latifolia*	-	-	Blue	Yes	X

***Note:** The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.1.5 Wildlife

The study area for KA1 LTL and KA1 LOP 168 does not overlap with any provincial approved UWRs, WHAs, or WMAs (DataBC2018). The northern portion of the study area overlaps with the South Thompson River IBA (BirdLife International et al. 2018). This IBA is frequented by waterfowl that over-winter on the South Thompson River, and several species of breeding birds that use riparian vegetation associated with the river for nesting sites (BirdLife International et al. 2018). Breeding birds of interest that have been recorded in the IBA include osprey, bald eagle, trumpeter swan (*Cygnus buccinator*), wood duck (*Aix sponsa*), and Lewis's woodpecker (*Melanerpes lewis*) (BirdLife International et al. 2018). No raptor nests were identified during desktop studies (WiTS 2018) or during the PFR. However, three non-raptor bird nests and other observations of wildlife and wildlife habitat features were recorded during the PFR (**Table 3.7**).

Table 3.7 Wildlife and Wildlife Habitat Features Observed in the KA1 LTL and KA1 LOP 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Rock and talus outcrop. Potential snake/bat habitat. South facing. North side of lateral	TO-02
W002	Confirmed Lewis's Woodpecker nest (cavity in hydro pole). Nesting pair observed. West side of lateral	TO-02
W003	Rock and talus outcrop. Potential snake/bat habitat. North-northeast facing. West side of lateral	TO-03
W004	Rock and talus outcrop. Potential snake/bat habitat. North-northeast facing. East side of lateral	TO-03
W005	Earthen burrow/den (unidentified) under snag. West side of lateral	TO-03
W006	Wildlife tree with cavities. South side of lateral	TO-03
W007	Cliff, evidence of swallow nesting site (species unidentified). Three adults observed. East side of lateral	TO-03
W008	Exposed salty bank/possible mineral lick. Abundant deer droppings and tracks. East side of lateral	TO-03
W009	Cliff, northern rough-winged swallow nesting site (at least three nests). Eight to ten adults observed. West side of lateral	TO-03
W010	Willow (*Salix ssp.*) / alder (*Rubus ssp.*) thicket. Potential wildlife attractant. West side of lateral	TO-03
W011	Nest box installed on ponderosa pine tree. Nesting status unconfirmed. West side of lateral	TO-03

The grassland and mature (i.e., age classes 6 to 7) coniferous forest habitats present within the study area may provide foraging habitat and nesting or denning sites for a variety of wildlife, including species of wildlife of concern. Desktop studies identified 18 wildlife species of concern with medium or high potential to occur within the KA1 LTL and KA1 LOP 168 study area (**Table 3.8**). Three of these species have known occurrences within the study area and four have federally designated critical habitat polygons within or overlapping the study area (DataBC 2018). One or more instances of mapped masked (i.e., confidential) CDC occurrences overlap the study area (DataBC 2018). One nearby occurrence (ID #6632) was identified by BC CDC as potentially vulnerable to Project activities (Stipec, K. pers.comm. 2018). Due to the sensitive nature of the species and its location, it is not identified in this report. However, based on review of the information provided by the BC CDC, this occurrence is not anticipated

to be directly impacted by Project activities. Nevertheless, it is recommended that BC CDC is contacted prior to construction to better understand if any mitigation is required.

Table 3.8 Wildlife of Concern with Medium or High Potential to Occur in the KA1 LTL and KA1 LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Columbia Plateau Pocket Mouse	*Perognathus parvus*	-	-	Blue	Yes	-	High
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Merriam's Shrew	*Sorex merriami*	-	-	Red	Yes	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	Medium
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (April 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	Medium
Amphibians							
Great Basin Spadefoot	*Spea intermontana*	1-T (Jun 2003)	T (Apr 2007)	Blue	Yes	-	High
Reptiles							
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	1-T (Jan 2005)	T (Apr 2013)	Blue	Yes	-	High
North American Racer	*Coluber constrictor*	1-SC (Aug 2006)	T (Nov 2015)	Blue	Yes	-	High
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High

Table 3.9 Wildlife of Concern with Known Occurrences or Critical Habitat in the KA1 LTL and KA1 LOP 168 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	730,976	Designated Critical Habitat encapsulates the range of Thompson population of American badger and overlaps entire lateral (BC CDC 2018) During PFR, field crew encountered a field biologist who claimed that there was an active badger den approximately 200 m east of the lateral around chainage 1+12	-	-	-
Mule/White-tailed Deer	-	-	Abundant deer droppings and tracks observed during PFR	-	-	-
Lewis's Woodpecker	-	-	Active nest observed during PFR in hydro pole adjacent to ROW	Overlaps	1,247,494	Federally-designated (final status) polygon overlaps central part of study area, and is overlapped by lateral between approximate chainages 1+7 and 2+8. Within polygon, critical habitat is identified where known and potential nesting trees exist (alive, standing or dead), plus a 400 m buffer around where key foraging habitat attributes (standing trees not exceeding 35% canopy closure and presence of fruit-bearing shrubs and perennial grasses) are present (ECCC 2017*a*)
Great Basin Spadefoot	Overlaps	1,951	Occurrence consists of four observation records of Great Basin spadefoot. One observation overlaps lateral at chainage 0+20, and a second is located in the pulp mill north of the study area (CDC 2018)	160	463,344	Federally-designated (final status) polygon overlaps with the north end of study area overlaps with detailed habitat units within which core and connectivity critical habitat are found. Polygon does not overlap the lateral (ECCC 2017*b*).

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Gopher Snake, *deserticola* subspecies	-	-	-	Overlaps	1,564,686	Federally-designated (proposed status) polygon overlaps with the southern portion of the study area, and the southern approximately 1.5 km of the lateral. Within polygon, core critical habitat is identified where the following attributes and features are present: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, open coniferous forest, riparian areas and wetland habitat (ECCC 2017*c*)
Western Rattlesnake	-	-	-	392	43,060	Federally-designated (proposed status polygon overlaps with the north end of the study area, and habitat containing biophysical features required by the species is considered critical habitat. Polygon does not overlap with the lateral (ECCC 2017*c*)

3.2 SAL LOP 168

SAL LOP 168 is 44.9 km long, with southern terminus near Otter Lake and northern terminus in Salmon Arm. The loop is aligned in an approximately north to south direction, roughly paralleling Highway 97A and 97C. An overview of the identified environmental receptors within the study area is provided in Sections **3.2.1** to **3.2.5**. Maps pertaining to this lateral are located on **Figures TO-04** to **TO-32** (**Appendix A**).

SAL LOP 168 was assessed over a five-day period including May 23, 24, 30 and 31 and June 1, 2018. The lateral was assessed on foot where private property access could be confirmed by an on-site land owner, and by vehicle on public roads where land owners were not available to provide consent. When access to private property was granted, the lateral was walked in either direction from the access point (e.g., a driveway that intercepts the lateral). Sections of the lateral that parallel or intersect existing public road infrastructure were assessed by vehicle. These sections were primarily along agricultural land and where the lateral ran through residential or commercial areas.

Photos were taken along the lateral at intervals generally less than 1000 m, additional photos were documented at mapped pipeline infrastructure locations (e.g., bends, welds, TP stations, etc.), areas where the land use or ecology changes, wildlife and vegetation feature locations, and at watercourses.

3.2.1 Land Use

Most of the lateral is in agricultural and rural areas, but also passes through undeveloped forested lands and urban centres. The lateral crosses Highway 97A near chainage 4+45. It also runs immediately adjacent to Highway 97A and Enderby 2 Indian Reserve from approximate chainages 21+42 to 24+05. The lateral passes through Enderby 2 Indian Reserve between chainages 24+07 and 24+36. A summary of the land use within the study area for SAL LOP 168 is provided in **Table 3.10**.

Table 3.10 Overview of Land Use within the SAL LOP 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Agency:1.2 **Crown Provincial:** 1.2 **Municipal:** 17.3 **Private**:774.4 **None:**56.7 **Unknown:**0.9	Columbia-Shuswap, North Okanagan	Salmon Arm, Enderby, Spallumcheen, Armstrong	Runs through the west side of Shuswap National Golf Course (previously known as Canoe Creek Golf Course) Lateral intersects with Environmentally Sensitive Riparian Areas in Salmon Arm, a Natural Environment Development Permit Areas in Armstrong, and Water Body Protection – Natural Environment Development Permit Areas in the Township of Spallumcheen, as mapped by the Official Community Plans for each municipality (City of Salmon Arm 2011, Township of Spallumcheen 2011, City of Armstrong 2014)	6654.6	128	**1**:16.6 **2:**233.5 **3**:132.7 **4:**80.2 **5**:135.7 **6:**39.4 **7**:27.3

3.2.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the SAL LOP 168 lateral are provided in **Table 3.11**.

Table 3.11 Summary of Areas of Potential Environmental Concern for Lateral SAL LOP 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
SAL LOP 168 (Inland Gas Upgrade Project)							
N1	Salmon Arm Training Area – Former firing and explosives range remediated for metals contamination (Corner of 30th St and 20th Ave SE, Salmon Arm)	Metals	FCSI (ID 16439011)	30 m east	Low	530	TO-05
N2	Sawmill operation – Teal Cedar Products Ltd. (4051 45th St SE, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, chlorinated and non-chlorinated phenols, metals	Aerial imagery	On-Site	Medium	265	TO-06
N3	Machine and auto body shop – Mt. Ida Machine & Welding (4121 45th St SE, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial imagery	25 m northeast	Low	80	TO-06
N4	Various current and historical industrial operations in Salmon Arm Industrial Park – Including machine shop and waste hauler (South side of 45th St SE, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial imagery	On-site	Medium	390	TO-06
N5	Auto parts yard – Westside Towing & Used Auto Parts (4850 46 Ave SE, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Aerial imagery	On-site	High	115	TO-06 And TO-07
N6	Fabricating shop – Milestone Fabrication (4880 46 Ave SE, Salmon Arm)	VOCs, metals	Aerial imagery	29 m northeast	Low	100	TO-06 And TO-07

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
N7	Sawmill machinery storage – Vertical West Timber Ltd. (4711 - 50th Street SE, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, chlorinated and non-chlorinated phenols, metals	Aerial imagery	On-site	Low	170	TO-07

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
N8	Active Esso service station with known off-site migration (5655 Highway 97A, Enderby)	BTEX/VPH, EPH, PAHs, metals	Site Reg (ID 19918)	15 m west	High	105	TO-17

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
FCSI – Federal Contaminated Sites Inventory
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons
Site Reg – BC MOE Online Site Registry

3.2.3 Fish and Fish Habitat

Twenty-seven FWA mapped watercourses were identified within the SAL LOP 168 study area during desktop assessment. During PFR activities, ten FWA mapped watercourses were observed to have no identifiable stream channel; and an additional ten unmapped water features (e.g., streams, seeps, wetlands, flooded fields) were observed and subsequently mapped. Two of the mapped watercourses are flooded fields with evidence they dry out and are seasonally cultivated (this assumption should be verified if important). If pipeline upgrades are timed during dry/low flow conditions (e.g., when flooded fields are dry), 25 watercourses potentially require riparian setbacks. The Columbia-Shuswap and North Okanagan regional districts have adopted RAR setbacks, and the City of Salmon Arm requires a development permit within identified Environmentally Sensitive Riparian Development Permit Areas (e.g., within 30 m of a stream); as such, a SPEA was calculated for each of the 25 watercourses. Some pipeline upgrade activities may not require development permits within the ALR and therefore may not require a SPEA.

Watercourse summaries are in **Table 3.12** and biophysical descriptions are provided in **Appendix D**.

Table 3.12 Summary of Waterbodies within the SAL LOP 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_SAL LOP 168_000	Stream - Intermittent	0	No	No	15-30	TO-04
TO_SAL LOP 168_001	Stream - Intermittent	0	UKN	Yes: FWA/CSRD	30*	TO-05
TO_SAL LOP 168_002	NSCI	0	UKN	Yes: FWA/CSRD	N/A*	TO-05
TO_SAL LOP 168_003	Stream - Permanent	0	UKN	Yes: FWA/CSRD	N/A (culverted)	TO-06
TO_SAL LOP 168_004	Stream - Intermittent	0	UKN	Yes: FWA/CSRD	UKN	TO-07
TO_SAL LOP 168_005	Stream - Intermittent	0	UKN	Yes: FWA/CSRD	30	TO-07
TO_SAL LOP 168_006	Stream - Permanent	0	UKN	Yes: FWA/CSRD	15*	TO-08

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_SAL LOP 168_007	NSCI	0	No	Yes: FWA/CSRD	N/A*	TO-09 TO-10
TO_SAL LOP 168_008 (Crossman Creek)	Stream - Permanent	0	UKN	Yes: FWA/NORD	15-30*	TO-10 TO-11 TO-12
TO_SAL LOP 168_009 (Gardom Creek)	Stream - Permanent	0	Yes	Yes: FWA/NORD	30	TO-11 TO-12
TO_SAL LOP 168_010	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30	TO-12
TO_SAL LOP 168_011-	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30	TO-14
TO_SAL LOP 168_012	NSCI	0	UKN	Yes: FWA No: NORD	N/A	TO-15 TO-16
TO_SAL LOP 168_013 (Leduc Creek)	Stream - Permanent	0	UKN	Yes: FWA/NORD	30*	TO-17
TO_SAL LOP 168_014	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30*	TO-18
TO_SAL LOP 168_015	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30*	TO-23
TO_SAL LOP 168_016 (Deep Creek)	Stream - Permanent	0	Yes	Yes: FWA/NORD	30*	TO-24
TO_SAL LOP 168_017	NSCI	0	UKN	Yes: FWA/NORD	N/A	TO-24
TO_SAL LOP 168_018	NSCI	0	No	Yes: FWA/NORD	N/A	TO-24 TO-26
TO_SAL LOP 168_019	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30*	TO-26
TO_SAL LOP 168_020 (Sutton Creek)	Stream - Permanent	0	UKN	Yes: FWA/NORD	30*	TO-26
TO_SAL LOP 168_021	NSCI	0	No	Yes: FWA/NORD	N/A*	TO-27
TO_SAL LOP 168_022	NSCI	0	UKN	Yes: FWA/NORD	N/A*	TO-28
TO_SAL LOP 168_023 (Sherban Brook)	Stream - Permanent	0	UKN	Yes: FWA/NORD	30*	TO-29
TO_SAL LOP 168_024	NSCI	0	UKN	Yes: FWA/NORD	N/A*	TO-30
TO_SAL LOP 168_025	Stream - Intermittent	0	UKN	Yes: FWA/NORD	30*	TO-30
TO_SAL LOP 168_026	NSCI	0	UKN	Yes: FWA/NORD	N/A*	TO-30
TO_SAL LOP 168_027	NCD	0	UKN	No	N/A	TO-06
TO_SAL LOP 168_028	Stream -	0	UKN	No	30	TO-14

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
	Permanent					
TO_SAL LOP 168_029	Stream - Permanent	0	UKN	No	30	TO-13
TO_SAL LOP 168_030	Wetland	0	UKN	No	UKN	TO-13
TO_SAL LOP 168_031	Stream - Permanent	0	UKN	No	30	TO-13
TO_SAL LOP 168_032	Wetland	0	UKN	No	UKN*	TO-15
TO_SAL LOP 168_033	NCD	0	No	No	N/A*	TO-15
TO_SAL LOP 168_034	NCD	0	No	No	N/A*	TO-15
TO_SAL LOP 168_035	Stream - Permanent	0	UKN	No	5-15	TO-16
TO_SAL LOP 168_036	NSCI	50	No	Yes: FWA/NORD	N/A*	TO-27

[1] Calculated from a Simple Assessment

* Watercourse within ALR, SPEA may not apply if no development permit is required

Notes: 0 = crosses lateral; NSCI = No stream channel identified; NCD = Non-classified drainage; UKN = unknown; N/A = not applicable

3.2.4 Vegetation

SAL LOP 168 is located in the Interior Douglas-fir Very Dry Hot and Moist Warm (IDFxh and IDFmw) subzones. The southern-most 19.7 km of the loop is located within the IDFxh subzone, which occurs at major valleys of the southern Interior Plateau. The northern-most 25 km of the loop is located within the IDFmw subzone, which occurs in a narrow band transition to the Interior “wet belt” from east of Peachland to Salmon Arm. The natural state of both of these subzones is often composed of mature forest dominated by Douglas-fir (Hope et al. 1991).

Anthropogenic activity has modified much of the natural vegetation within the SAL LOP 168 study area, which is largely comprised of agricultural fields. No provincial approved OGMAs or areas of old growth forest were identified within the study area during the desktop studies. However, small patches of mature (i.e., age classes 7 and 8) coniferous and mixed forest were present along the length of the lateral, particularly in the section of the lateral between Enderby and Salmon Arm, and in riparian corridors with interior Douglas-fir, ponderosa pine, western larch (*Larix occidentalis*), and birch (*Betula spp*) (DataBC 2018).

Patches of invasive vegetation were identified in the SAL LOP 168 study area during the desktop search, with two large sites near chainage 2+25 and between chainage 38+5 and 38+8. In total, approximately 17.7 ha of invasive vegetation (comprised of 16 species and distributed over 20 sites) were identified in the study area during the desktop search (**Table 3.13** and **Figures TO-04** to **TO-32**). An additional six localized sites of invasive vegetation (leafy spurge (*Euphorbia esula)*, sulfur cinquefoil (*Euphorbia esula*), mountain bluet (*Centaurea montana)* and hawkweed (*Hieracium ssp.*) were identified in during PFR (**Figures TO-04, TO-06, TO-30** and **TO-32**).

Table 3.13 Invasive Vegetation Identified within the SAL LOP 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Burdock species	*Arctium spp.*	BU	Noxious (Regionally)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DT	Noxious (Provincially)
Field bindweed	*Convolvulus arvensis*	FB	Invasive
Hawkweed species*	Hieracium spp.	HS	Noxious (Regionally)
Hoary alyssum	*Berteroa incana*	HA	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Knapweed species	*Centaurea spp.*	KS	Noxious (Provincially)
Leafy spurge	*Euphorbia esula*	LS	Noxious (Provincially)
Mountain bluet*	*Centaurea montana*	MO	Invasive
Russian olive	*Elaeagnus angustifolia*	RS	Invasive
Scotch thistle	*Onopordum acanthium*	SC	Noxious (Regionally)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Sulphur cinquefoil	*Potentilla recta*	ST	Noxious (Regionally)
Common tansy	*Cirsium arvense*	TC	Noxious (Regionally)
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		18
	Number of Sites		25
	Total Area (m^2)		176,695

Note: Species with asterisk were identified during PFR only.

Desktop studies identified four plant species of concern with medium or high potential to occur within the SAL LOP 168 study area and 33 at-risk ecological communities that occur within the BEC subzones overlapped by the study area (DataBC 2018). None of these species or ecological communities have federally designated critical habitat polygons or recorded occurrences within the study area (DataBC 2018).The field crew noted a small patch of unidentified lupine (possibly silvery lupine (*Lupinus argenteus* var. *laxiflorus))* near chainage 44+87 during PFR (**Figure TO-04**, **Feature ID V009**).

Table 3.14 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the SAL LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Giant helleborine	*Epipactis gigantea*	3	NAR (Nov 2015)	Yellow	Yes	Medium
Mexican mosquito fern	*Azolla mexicana*	1-T (Jun 2003)	T (Nov 2008)	Red	Yes	Medium
Silvery lupine	*Lupinus argenteus* var. *laxiflorus*	-	-	Red	Yes	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Ecological communities						
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Water birch / roses	*Betula occidentalis / Rosa* spp.	-	-	Red	Yes	X
Seacoast bulrush alkali marsh	*Bolboschoenus maritimus* var. *paludosus*	-	-	Red	Yes	X
Alkali saltgrass herbaceous vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X
Trembling aspen / mock-orange	*Populus tremuloides / Philadelphus lewisii*	-	-	Red	Yes	X
Trembling aspen / common snowberry / mountain sweet-cicely	*Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi*	-	-	Red	Yes	X
Trembling aspen / common snowberry /	*Populus tremuloides / Symphoricarpos*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Kentucky bluegrass	*albus / Poa pratensis*					
Black cottonwood - water birch	*Populus trichocarpa - Betula occidentalis*	-	-	Red	Yes	X
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple - red-osier dogwood	*Pseudotsuga menziesii / Acer glabrum - Cornus stolonifera*	-	-	Red	Yes	X
Douglas-fir / shrubby penstemon - pinegrass	*Pseudotsuga menziesii / Penstemon fruticosus - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / snowbrush	*Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / Idaho fescue	*Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	-	-	Blue	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Antelope-brush / needle-and-thread grass	*Purshia tridentata / Hesperostipa comata*	-	-	Red	Yes	X
Hard-stemmed bulrush deep marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Long-awned three-square bulrush Alkali Marsh	*Schoenoplectus pungens* var. *longispicatus*	-	-	Red	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Western redcedar - paper birch / oak fern	*Thuja plicata - Betula papyrifera / Gymnocarpium dryopteris*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / red-osier dogwood	*Thuja plicata - Pseudotsuga menziesii / Cornus stolonifera*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / false Solomon's seal	*Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum*	-	-	Red	Yes	X
Common cattail marsh	*Typha latifolia*	-	-	Blue	Yes	X

Notes: Ecological communities were not assigned a risk ranking, potential to occur was indicated based on the known occurrence of a particular community within one or more of the BEC subzone(s) overlapped by the Project study area.

3.2.5 Wildlife

The SAL LOP 168 study area does not overlap with any IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018). No raptor nests were identified at the desktop level (WiTS 2018); however, four potential raptor nests and other observations of wildlife and wildlife habitat features were recorded during the PFR (**Table 3.15**).

Table 3.15 Wildlife and Wildlife Habitat Features Observed in the SAL LOP 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Barn swallow nesting colony (ten or more pairs) in barn adjacent to Highway 97A. Located inside of barn. Left side of lateral, approximately 100 m west of the lateral near bend the zone near chainage 18+382	TO-21
W002	Potential great blue heron rookery. Two adults spotted carrying nesting material. Vocalizations (possibly young) detected from mature forest stand east side of lateral. Right side of lateral near the bend zone at chainage 25+137	TO-16
W003	Pond in field on west side of lateral: Amphibian breeding location/waterfowl foraging. Several unidentified tadpoles and adult frog (likely Columbia spotted frog (*Rana luteiventris),* observed	TO-15
W004	Flooded field / cottonwood stand - possible wildlife attractant. West side of Highway 97A	TO-15
W005	Active osprey nest on platform adjacent to substation. East side of lateral. Approximately 300 m away from lateral.	TO-16
W006	Western painted turtle observation. West side of lateral in watercourse near Gardhom Lake Road	TO-12
W007	Active osprey nest on tower on near Deep Creek Road. East side of lateral, approximately 80 m from lateral	TO-10
W008	Game trail / wildlife tree. Five mule deer observed nearby. West side of lateral	TO-31
W009	Game trail/ potential red-tailed hawk nest nearby. Two adults observed flying overhead in low circles, calling frequently	TO-30
W010	Mature forest patch/riparian area - possible wildlife attractant. Five mule deer observed nearby	TO-30
W011	Wildlife Tree (one). West side of lateral, adjacent to RoW	TO-29
W013	Wildlife Trees (two). Adjacent to RoW	TO-26
W014	Wildlife Tree (one). East side of lateral, adjacent to RoW	TO-26
W015	Potential red-tailed hawk nest in forest patch on left side of lateral. Adult pair circling overhead	TO-05
W016	Wildlife tree (one)/White-tailed deer observation. East side of lateral	TO-04

A variety of wildlife habitat is present within the study area, including deciduous, mixed and coniferous forest (ranging in age class from 3 to 4). Additional habitat types present include cleared agricultural fields, cleared RoWs, riparian and wetland habitats. These habitat types may provide security and thermal habitat, corridors for movement (including migration and dispersal), foraging, and nesting habitat for a variety of wildlife, including species of concern.

Desktop studies identified 21 wildlife species of concern with medium or high potential to occur within the SAL LOP 168 study area (**Table 3.16**). Eight of these species have known occurrences within the study area and one (American Badger) has federally designated critical habitat polygons that overlaps the study area (DataBC 2018) (**Table 3.17**). Instances of mapped masked (i.e., confidential) CDC occurrences were identified overlapping the north and south ends of the study area (DataBC 2018). Through correspondence with the CDC, these occurrences are not anticipated to be affected by Project activities (Stipec, K. pers.comm. 2018).

Table 3.16 Wildlife of Concern with Medium or High Potential to Occur in the SAL LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
American Bittern	*Botaurus lentiginosus*	-	-	Blue	Yes	-	Medium
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	High
Great Blue Heron, *herodias* subspecies	*Ardea herodias herodias*	-	-	Blue	Yes	Yes	High
Long-billed Curlew	*Numenius americanus*	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (April 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Western Screech-Owl, *macfarlanei* subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Great Basin Spadefoot	*Spea intermontana*	1-T (Jun 2003)	T (Apr 2007)	Blue	Yes	-	High
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Wildlife Act Section 34b	Potential to Occur
Reptiles/Turtles							
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	1-T (Jan 2005)	T (Apr 2013)	Blue	Yes	-	High
North American Racer	*Coluber constrictor*	1-SC (Aug 2006)	T (Nov 2015)	Blue	Yes	-	High
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta* pop. 2	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High

Table 3.17 Wildlife of Concern with Known Occurrences or Critical Habitat in the SAL LOP 168 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	4,175,090	Observation covers the range of the Okanagan-Boundary subpopulation (DataBC 2018). Overlaps with southern-most 3.7 km of the lateral	-	-	-
Mule/White-tailed Deer	-	-	Areas of deer droppings observed during PFR	-	-	-
Barn Swallow	-	-	Nesting colony identified during PFR	-	-	-
Great Blue Heron	-	-	Potential rookery identified during PFR. Located near the location of the proposed bend zone at chainage 25+137	-	-	-
Osprey	-	-	Active nests identified during PFR	-	-	-
Great Basin Spadefoot	172	89,414	Several observations of adults from 2000-2012 near St. Anne's pond and the South end of Otter Lake near chainage 2+90 (DataBC 2018)	Overlaps	2,860,944	Federally-designated (final status) polygon overlaps south end of study area (and lateral between approximate chainages 2+3 and 4+0) near Otter Lake. Within polygon, core critical habitat is identified where specific biophysical features and attributes are present, including vernal ponds, slow-moving waterbodies, and grassland, shrub-steppe and open forest habitat (ECCC 2017*b*)
North American Racer	Overlaps	1,892,122	Historic observation (1946) in downtown Enderby (DataBC 2018)	-	-	-
Western Painted Turtle	-	-	Individual identified during PFR	-	-	-

3.3 SA3 LTL 168

SA3 LTL 168 is an 800 m long lateral that connects to the SAL LOP 168 in a north-south direction along the west side of Shuswap National Golf Course, south of Salmon Arm. The lateral was assessed on June 1, 2018, started at the SA3-1 valve assembly station adjacent to the Shuswap National Golf Course clubhouse and ended at the FortisBC station on Auto Road. The SAL LOP 168 lateral follows the golf course maintenance road along the boundary of the golf course. Permission was obtained from the General Manager to use the road for PFR purposes. Maps pertaining to this lateral are located on **Figure TO-07** (**Appendix A**).

Reference photos were taken approximately every 200 m. An overview of the identified environmental receptors within the study area is provided in **Sections 3.3.1** to **3.3.5**.

3.3.1 Land Use

A summary of the land use within the study area is provided in **Table 3.18**.

Table 3.18 Overview of Land Use within the SA3 LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Municipal: 0.6 **Private:**18.0	Columbia-Shuswap	Salmon Arm (northern-most 30 m only)	Lateral runs along the south side of Shuswap National Golf Course (previously known as Canoe Creek Golf Course)	151.8	3	**5**:14.9 **7**:0.3

3.3.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the SA3 LTL 168 lateral are provided in **Table 3.19**.

Table 3.19 Summary of Areas of Potential Environmental Concern for Lateral SA3 LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
SA3 LTL 168 (Inland Gas Upgrade Project)							
O1	Fortis pump station – Site Registry entry noting mercury contamination (6040 SE Auto Road, Salmon Arm)	Mercury	Site Reg (ID 4473)	On-Site	High	50	TO-07
O2	Former Salmon Arm Municipal Landfill (5920 Auto Road south east, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, chlorinated and non-chlorinated phenols, metals	Site Reg (ID 6049)	Adjacent	High	50	TO-07
O3	Shuswap National Golf Course Maintenance Shop (End of Lashburn Road, Salmon Arm)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	30 m east	Low	75	TO-07

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.3.3 Fish and Fish Habitat

Three FWA mapped watercourses were identified within the SA3 LTL 168 study area during the desktop assessment. During the PFR, two of the FWA mapped watercourses were not observed; the third was confirmed to be a golf course water feature (i.e., pond) with limited riparian habitat. This pond is within the North Okanagan Regional District, where RAR setbacks apply. If construction activities occur within 30 m of the pond, riparian setbacks will apply.

Watercourses are summarised in **Table 3.20** and biophysical descriptions are provided in **Appendix D**.

Table 3.20 Summary of Waterbodies within the SA3 LTL 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_SA3 LTL 168_001	NSCI	0	No	Yes	N/A	TO-07
TO_SA3 LTL 168_002	NCD (pond)	80	UKN	Yes	30 m	TO-07
TO_SA3 LTL 168_003	NSCI	0	No	Yes	N/A	TO-07

[1] Calculated from a Simple Assessment.

Notes: NSCI = No stream channel identified; NCD = Non-classified drainage; N = No; UKN = unknown; N/A= Not applicable.

3.3.4 Vegetation

The SA3 LTL 168 study area is located within the Interior Douglas-fir Moist Warm (IDFmw) subzone, which occurs in a narrow band that transitions to the Interior “wet belt” from east of Peachland to Salmon Arm (Hope, Mitchell, et al. 1991). Vegetation within the study area consisted mainly of manicured grasses associated with the Shuswap National Golf Course on the east side of the lateral, and an area of forest mapped by the VRI as age class 6 and dominated by Douglas-fir on the west side of the lateral. Mature conifers are also present along both sides of the southern portion of the RoW. No provincial approved OGMAs or areas of old growth forest were identified in the study area during the desktop studies.

One patch of invasive spotted knapweed (*Centaurea biebersteinii*), which covers approximately 1.9 ha, was identified in the southern portion of the study area, though this site is associated with the SAL LOP 168 lateral. No additional patches of invasive vegetation were identified during the PFR.

Desktop studies identified three plant species of concern with medium or high potential to occur within the SA3 LTL 168 study area and eight at-risk ecological communities that occur within the BEC subzone overlapped by the study area (DataBC 2018**)**. None of these species or ecological communities have known occurrences or federally designated critical habitat polygons within the study area (DataBC 2018).

Table 3.21 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the SA3 LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Giant helleborine	*Epipactis gigantea*	3	NAR (Nov 2015)	Yellow	Yes	Medium
Mexican mosquito fern	*Azolla mexicana*	1-T (Jun 2003)	T (Nov 2008)	Red	Yes	High
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Ecological communities						
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / shrubby penstemon - pinegrass	*Pseudotsuga menziesii / Penstemon fruticosus - Calamagrostis rubescens*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Western redcedar - paper birch / oak fern	*Thuja plicata - Betula papyrifera / Gymnocarpium dryopteris*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / red-osier dogwood	*Thuja plicata - Pseudotsuga menziesii / Cornus stolonifera*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia*	-	-	Blue	Yes	X

Notes: Ecological communities were not assigned a risk ranking, potential to occur was indicated based on the known occurrence of a particular community within one or more of the BEC subzone(s) overlapped by the Project study area.

3.3.5 Wildlife

The SA3 LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Notable habitat features within the study area include the aquatic features in the golf course, and the stand of mature conifers on the west side lateral. These areas may provide breeding habitat for amphibians and nesting habitat, thermal and security habitat, and corridors for movement (including migration and dispersal) for a variety of wildlife, including species of wildlife of concern.

Desktop studies identified ten wildlife species of concern with medium or high potential to occur within the SA3 LTL 168 study area (**Table 3.22**). None of these species have recorded occurrences or federally designated critical habitat polygons within or overlapping the study area (DataBC 2018). One or more instances of mapped masked (i.e., confidential) CDC occurrences were identified overlapping the study area (DataBC 2018).Through correspondence with the CDC, it was determined that these occurrences are not anticipated to be affected by Project activities (Stipec, K. pers.comm. 2018). No observations of wildlife or wildlife habitat features were recorded during the PFR.

Table 3.22 Wildlife of Concern with Medium or High Potential to Occur in the SA3 LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
American Bittern	*Botaurus lentiginosus*	-	-	Blue	Yes	-	Medium
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium

3.4 COL LOP 168

COL LOP 168 is 3.8 km long and is aligned in an east-west direction between the City of Vernon and District of Coldstream. The preferred pipeline upgrade option for this lateral is PRS. The study area for this lateral was expanded to include a 500 m buffer around the lateral, as well as around the PRS Site #5. The PFR was conducted at the two proposed PRS sites (Sites #5 and #6) at the west end of the COL LOP 168 lateral (**Section 3.5**), as well as the east end of the COL LOP 168 lateral to assess known APECs. Vehicle access to the east end was from Reservoir Road. The east end is adjacent to the Kalamalka Research Station, Mission Hill Water Treatment Plant, and a residential neighborhood. Maps pertaining to this lateral are located on **Figures TO-33** to **TO-35** (**Appendix A**).

The PFR was conducted on May 23, 2018. Vehicle access to the west end was via the City of Vernon Hesperia Landfill road; however, access was limited to 100 m from PRS Site #6 due to a cattle feeding trough blocking the access road. Site #6 was observed from road approximately 100 m away.

Reference photos were captured for each potential PRS location. An overview of the identified environmental receptors within the study area is provided in **Sections 3.4.1** to **3.4.5**.

3.4.1 Land Use

Most of COL LOP 168 is located within grasslands associated with rural and agricultural areas, old military grounds, the Alan Brooks Nature Center, and the Kalamalka Research Station. The lateral crosses Highway 17 at approximate chainage 2+9 near the Clarke Road / College Way intersection. Both proposed PRS stations (#5 and #6) are located in municipally-owned land within the ALR. The proposed location of Site #5 is on the lawn of Vernon Seed Orchard Company. The proposed location of Site #6 is within pastureland used for cattle grazing at the time of the PFR. A summary of the land use within the study area is provided in **Table 3.23**.

Table 3.23 Overview of Land Use within the COL LOP 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Federal: 14.4 **Crown Provincial**: 35.5 **Municipal:** 12.6 **Private:** 9.7	North Okanagan	District of Coldstream (eastern portion), City of Vernon (western portion)	Row Park, an off-leash dog park, is located on south side of Bench Row Road, across from the proposed location of PRS #5. A small roadside strip apparently used for parking is located immediately adjacent to the RoW on north side of Bench Row Road The lateral appears to cross a mix of low and medium conservation value land per the City of Vernon Official Community Plan (City of Vernon 2018)	779.6	23	**3**:35.2 **4:**1.1 **5**:4.2 **6:**21.1

3.4.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the COL LOP 168 lateral are provided in **Table 3.24**.

Table 3.24 Summary of Areas of Environmental Concern for Lateral COL LOP 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
COL LOP 168 (PRS)							
P3/Q1	FortisBC pump station – Site Registry entry noting mercury contamination (13190 Reservoir Road, Coldstream)	Mercury	Site Reg (ID 2561)	On-Site	High	15	TO-35
P4/Q2	Mission Hill Water Treatment Plant (Reservoir Road, Coldstream)	Sodium, Chloride	Aerial Imagery	Adjacent	Low	140	TO-35
Q3	Former military facility and range – Included waste oil dumping, burn areas, facility operations and heavy equipment training. (West of Highway 97 and Clerke Road, Coldstream)	BTEX/VPH, EPH, PAHs, VOCs, metals	FCSI (ID 00002512), Aerial Imagery	Adjacent	Medium	1,900	TO-34

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VPH – Volatile Petroleum Hydrocarbons
Site Reg – BC ME Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
FCSI – Federal Contaminated Sites Inventory

3.4.3 Fish and Fish Habitat

Three FWA mapped watercourses were identified along the COL LOP 168 study area during the desktop assessment; two along the lateral, and one adjacent to PRS Site #5. Field assessment of watercourses along the lateral were not conducted as they are not expected to interact with PRS activities (PRS is the preferred activity for this loop). The watercourse adjacent to PRS Site #5 was assessed on site and observed to enter a culvert inlet and flow underground adjacent to PRS Site #5.

The lateral is within the North Okanagan Regional District, where RAR setbacks apply. However, watercourses within the ALR may not require a development permit.

Watercourses are summarized in **Table 3.25** and biophysical descriptions are provided in **Appendix D**.

Table 3.25 Summary of Waterbodies within the COL LOP 168 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_COL LOP 168_000[2]	Steam - Permanent	0	UKN	Yes	30*	TO-33
TO_COL LOP 168_001	Stream - Intermittent	50	UKN	Yes	30*	TO-35 TO-34
TO_COL LOP 168_002	Stream - Intermittent	0	UKN	Yes	30*	TO-33

[1] Calculated from a Simple Assessment.

[2] Watercourse associated with PRS Site #5 off Bench Row Rd (Adj to COL LOP 168).

* Watercourse within ALR; therefor, SPEA may not apply if no development permit is required.

3.4.4 Vegetation

The COL LOP 168 study area is located within the IDFxh subzone. Vegetation within the study area consists largely of pastureland, agricultural fields, and climax grassland habitat. Several young planted conifers associated with the Kalamalka Research Station are at the east end of the lateral. The exact site of PRS (#6) was not visited during the PFR but appeared to consist of grassland habitat being used for cattle grazing, as viewed from approximately 100 m away. Vegetation present at the site of PRS (#5) was a mowed lawn with deciduous trees present along the property boundaries. No provincial approved OGMAs or areas of old growth forest were identified in the study area.

Patches of invasive vegetation were identified in the study area during the desktop search. In total, approximately 100 m^2 of invasive vegetation comprised of 11 species and distributed over 8 sites were identified in the study area during the desktop search (see **Table 3.26** and **Figures TO-33-TO-35**). No additional sites of invasive vegetation were identified during the PFR.

Table 3.26 Invasive Vegetation Identified within the COL LOP 168 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Burdock species	*Arctium spp*	BU	Noxious (Regionally)
Dalmatian toadflax	*Linaria dalmatica*	DK	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DT	Noxious (Provincially)
Hoary alyssum	*Berteroa incana*	HA	Noxious (Regionally)
Hoary cress	*Cardaria draba*	HC	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Knapweed species	*Centaurea spp.*	KS	Noxious (Provincially)
Rush skeletonweed	*Chondrilla juncea*	RO	Invasive
Russian olive	*Elaeagnus angustifolia*	RS	Invasive
Scotch thistle	*Onopordum acanthium*	SC	Noxious (Regionally)
Sulphur cinquefoil	*Potentilla recta*	ST	Noxious (Regionally)
	Number of Species		11
	Number of Sites		8
	Total Area (m^2)		100

Desktop studies identified three plant species of concern with medium of high potential to occur within the COL LOP 168 study area and 31 at-risk ecological communities that occur within the BEC subzone overlapped by the study area (**Table 3.27**). None of these species or ecological communities have known occurrences or critical habitat within the study area[4] (DataBC 2018).

Table 3.27 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the COL LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Giant helleborine	*Epipactis gigantea*	3	NAR (Nov 2015)	Yellow	Yes	Medium
Mexican mosquito fern	*Azolla mexicana*	1-T (Jun 2003)	T (Nov 2008)	Red	Yes	High
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Ecological communities						
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Water birch / roses	*Betula occidentalis / Rosa* spp.	-	-	Red	Yes	X
Seacoast bulrush alkali marsh	*Bolboschoenus maritimus* var. *paludosus*	-	-	Red	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X

[4] Note: DataBC identifies a record of orange touch-me-not (*Impatiens aurella*) which overlaps with the study area; however, this species has since been down-listed to the provincial yellow list.

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X
Trembling aspen / mock-orange	*Populus tremuloides / Philadelphus lewisii*	-	-	Red	Yes	X
Trembling aspen / common snowberry / mountain sweet-cicely	*Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi*	-	-	Red	Yes	X
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	-	-	Red	Yes	X
Black cottonwood - water birch	*Populus trichocarpa - Betula occidentalis*	-	-	Red	Yes	X
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple - red-osier dogwood	*Pseudotsuga menziesii / Acer glabrum - Cornus stolonifera*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / snowbrush	*Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / Idaho fescue	*Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	-	-	Blue	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / needle-and-thread grass	*Purshia tridentata / Hesperostipa comata*	-	-	Red	Yes	X
Hard-stemmed bulrush (Deep Marsh)	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Long-awned three-square bulrush (Alkali Marsh)	*Schoenoplectus pungens* var. *longispicatus*	-	-	Red	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / red-osier dogwood	*Thuja plicata - Pseudotsuga menziesii / Cornus stolonifera*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / false Solomon's seal	*Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum*	-	-	Red	Yes	X
Common cattail Marsh	*Typha latifolia*	-	-	Blue	Yes	X

Notes: Ecological communities were not assigned a risk ranking, potential to occur was indicated based on the known occurrence of a particular community within one or more of the BEC subzone(s) overlapped by the Project study area.

3.4.5 Wildlife

The COL LOP 168 does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs. The mix of agricultural fields and grassland habitat present within the study area is suitable for a variety of wildlife, particularly species adapted to grassland habitats.

Desktop studies identified 11 wildlife species of concern with medium or high potential to occur within the COL LOP 168 study area (**Table 3.28**). Three of these species have known occurrences within the study area and four have federally designated critical habitat polygons within the study area (DataBC 2018). One or more instances of mapped masked (i.e., confidential) CDC occurrences overlap the study area (DataBC 2018). Three nearby occurrences (ID #s 7978, 6621, and 10427) were identified by BC CDC as potentially vulnerable to Project activities (Stipec, K. pers.comm. 2018). Due to the sensitive nature of the species and their location, and to ensure compliance with data-sharing agreement policy with the BC CDC, the identity and location of the species of occurrence record is not identified in this report. Based on review of the information provided by the BC CDC, one of these occurrences (ID# 7998) is considered to have potential to be impacted by Project activities. DataBC should be contacted prior to construction for further information regarding this occurrence and specific mitigation measures that may be required. No wildlife or wildlife habitat features were identified in the areas visited during the PFR.

Table 3.28 Wildlife of Concern with Medium or High Potential to Occur in the COL LOP 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
Western Harvest Mouse	*Reithrodontomys megalotis*	1-SC (Mar 2009)	SC (Apr 2007)	Blue	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	High
Long-billed Curlew	*Numenius americanus*	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	High
Amphibians							
Great Basin Spadefoot	*Spea intermontana*	1-T (Jun 2003)	T (Apr 2007)	Blue	Yes	-	High
Reptiles							
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	1-T (Jan 2005)	T (Apr 2013)	Blue	Yes	-	High
North American Racer	*Coluber constrictor*	1-SC (Aug 2006)	T (Nov 2015)	Blue	Yes	-	High

Table 3.29 Wildlife of Concern with Known Occurrences or Critical Habitat in the COL LOP 168 Study Area

English Name	Known Occurrences	Critical Habitat

	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	5,183,572	Observation covers the range of the American Badger population in the Okanagan-Boundary subpopulation and overlaps the entire lateral (CDC 2018)	-	-	-
Great Basin Spadefoot	151	48,199	Several occurrences of Great Basin spadefoot near Vernon BC, including one observation in the study area south of Upperton Road near chainage 2+25	Overlaps	9,296,915	Federally-designated (final status) polygons overlap with most of study area and entire lateral. Within polygons, core and connective critical habitat is identified where the following biophysical features and attributes are present (ECCC 2017*b*): Core: vernal ponds; lakes, ponds, marshes, springs, sluggish streams, and seasonally wetted margins around permanent waterbodies; or grassland, shrub-steppe and open forest. Connectivity: grassland, shrub-steppe, open forest, potentially including human-modified habitats such as urban and agricultural areas Some of identified critical habitat in study area is on federal land (in central portion of lateral)

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Gopher Snake, *deserticola* subspecies	417	8,672	Several occurrences of gopher snakes on Middleton mountain, two of which overlap with the east end of the study area (CDC 2018)	Overlaps	3,079,141	Federally designated (proposed status) polygons overlap central portion and eastern end of study area, and with the lateral between approximate chainages 0+8 to 3+3 and 3+6 t0 3+ to the eastern terminus. Within polygon, core critical habitat is identified where the following biophysical features and attributes are present: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, open coniferous forest, riparian areas and wetland habitat. (ECCC 2017*c*) Some of identified critical habitat in study area is on federal land (in central portion of lateral)
Western Rattlesnake	-	-	-	Overlaps	5,183,476	Federally-designated (proposed status) polygon overlaps with entire study area and entire length of lateral. Within polygon, critical habitat is identified where the following biophysical features and attributes are present: cliff, talus, rock outcrop, earth covered rock outcrop, rock piles or large rocks, grassland, shrub-steppe, open coniferous forest, riparian areas, and wetland habitat (ECCC 2017*c*). Some of identified critical habitat in study area is on federal land (in central portion of lateral)

3.5 COL LTL 219

COL LTL 219 is 1.8 km long and is aligned in a north to south direction between south Vernon and Coldstream. The preferred pipeline upgrade option for this lateral is PRS. The PFR was conducted at the two proposed PRS sites (Sites #5 and #6) at the west end of the COL LOP 168 lateral (**Section 3.5**), as well as both ends of the COL LTL 219 lateral to assess known APECs. Maps pertaining to this lateral are located on **Figures TO-35** to **TO-36** (**Appendix A**).

Vehicle access to the south end of COL LTL 219 was from Reservoir Road, which is adjacent to the Kalamalka Research Station (a forestry research station), Mission Hill Water Treatment Plant, and a residential neighborhood. Vehicle access to the north end was obtained from Polson Drive, which is adjacent to commercial buildings and the Vernon Golf and Country Club. The COL LTL 219 study area was photographed and assessed for vegetation and wildlife features. An overview of the identified environmental receptors within the study area is provided in **Sections 3.5.1** to **3.5.5**.

3.5.1 Land Use

The south end of the COL LTL 219 runs between the Kalamalka Research Station and a residential development, and the northern portion of the lateral runs along the west side of Vernon Golf and Country Club. Both proposed PRS stations (#5 and #6), which are outside of the study area for the lateral, are located in municipally owned land within the ALR. The proposed location of Site #5 is on the lawn of Vernon Seed Orchard Company. The proposed location of Site #6 is within pastureland used for cattle grazing at the time of the PFRA summary of the land use within the study area is provided in **Table 3.30**.

Table 3.30 Overview of Land Use within the COL LTL 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Federal: 2.1 **Crown Agency:** 4.0 **Crown Provincial:** 5.3 **Municipal:** 0.8 **Private**: 25.0 **Unknown:** 0.2	North Okanagan	District of Coldstream (southern-most 30 m only), City of Vernon	Runs through Vernon Golf and Country Club Study area also overlaps with the southern end of Polson Park, a municipal park with several walking and hiking trails in its southern portion The lateral also appears to cross a mix of low and medium conservation value land per the City of Vernon Official Community Plan (City of Vernon 2018)	324.2	13	**3**:9.1 **4:**1.9 **6:**14.8

Notes: Areas described in the land use summary do not include areas associated with the proposed PRS Sites #5 and #6, which are located outside of the study area for this lateral.

3.5.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the COL LTL 219 lateral are provided in **Table 3.31**.

Table 3.31 Summary of Areas of Environmental Concern for Lateral COL LTL 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
COL LTL 219 (PRS)							
P1	Former Okanagan Turbo - Known off-site migration was historically remediated and Certificate of Compliance obtained (1325 Polson Drive, Vernon)	BTEX/VPH, EPH, PAHs	Site Reg (ID 2503)	Adjacent	Medium	50	TO-36
P2	Railway Crossing (West of Polson Drive, Vernon)	BTEX/VPH, EPH, PAHs, metals	Aerial imagery	On-Site	Medium	10	TO-36
P3/Q1	FortisBC pump station – Site Registry entry notes mercury contamination (13190 Reservoir Road, Coldstream)	Mercury	Site Reg (ID 2561)	On-Site	High	15	TO-35
P4/Q2	Mission Hill Water Treatment Plant (Reservoir Road, Coldstream)	Sodium, Chloride	Aerial imagery	Adjacent	Low	140	TO-35

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.5.3 Fish and Fish Habitat

Four FWA mapped watercourses were identified within the COL LTL 219 study area during the desktop assessment; three that cross the lateral, and one adjacent to PRS Site #5. Field assessment of the watercourses along the lateral were not conducted because no watercourse interactions are expected along laterals with PRS as the preferred upgrade option. The watercourse adjacent to PRS Site #5 was assessed and was observed to enter a culvert inlet and flow underground adjacent to PRS Site #5.

COL LTL 219 is within the North Okanagan Regional District, where RAR setbacks apply. However, watercourses within the ALR may not require a development permit.

Watercourses are summarized in **Table 3.32** and biophysical descriptions are provided in **Appendix D**.

Table 3.32 Summary of Waterbodies within the COL LTL 219 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_COL LTL 219_001 (Vernon Creek)	Steam - Permanent	0	Yes	Yes	30	TO-36
TO_COL LTL 219_002	Stream - Intermittent	0	UKN	Yes	30*	TO-36
TO_COL LTL 219_003	Stream - Intermittent	0	UKN	Yes	30*	TO-36
TO_COL LOP 168_000[2]	Steam - Permanent	0	UKN	Yes	30*	TO-33

[1] Calculated from a Simple Assessment.

[2] Watercourse associated with PRS Site #5 off Bench Row Rd (Adj to COL LOP 168).

* Watercourse within ALR, SPEA may not apply if no development permit is required.

3.5.4 Vegetation

The COL LTL 219 study area is located within the IDFxh subzone. Vegetation within the study area consists mainly of manicured grasses associated with the Vernon Golf and Country Club on the east side of the lateral, young planted conifers associated with the Kalamalka Research Station on west side of the southern portion of the lateral, and a mix of shrubs and grasses on the west side of the northern portion of the lateral. No provincial approved OGMAs or areas of old growth forest were identified in the study area.

One area of invasive vegetation covering approximately 3 m^2 and comprised of six species was identified at the south end of the study area on the side of Reservoir Road (**Table 3.33** and **Figure TO-35**). No additional sites of invasive vegetation were identified during the PFR.

Table 3.33 Invasive Vegetation Identified within the COL LTL 219 Study Area

English Name	Scientific Name	Species Code	Designation (Weed Act)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Diffuse knapweed	*Centaurea diffusa*	DT	Noxious (Provincially)
Hoary alyssum	*Berteroa incana*	HA	Noxious (Regionally)
Knapweed species	*Centaurea spp.*	KS	Noxious (Provincially)
Russian olive	*Elaeagnus angustifolia*	RS	Invasive
Sulphur cinquefoil	*Potentilla recta*	ST	Noxious (Regionally)
	Number of Species		6
	Number of Sites		1
	Total Area (m^2)		3

Desktop studies identified three plant species of concern with medium or high potential to occur within the study area and 31 at-risk ecological communities that occur within the BEC subzone overlapped by the study area (**Table 3.34**). None of these species or ecological communities have known occurrences or critical habitat within the study area (DataBC 2018)[5].

[5] Note: DataBC identifies a record of orange touch-me-not (*Impatiens aurella*) which overlaps with the study area; however, this species has since been down-listed to the provincial yellow-list.

Table 3.34 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the COL LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Giant helleborine	*Epipactis gigantea*	3	NAR (Nov 2015)	Yellow	Yes	Medium
Mexican mosquito fern	*Azolla mexicana*	1-T (Jun 2003)	T (Nov 2008)	Red	Yes	High
Nonvascular Plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Ecological Communities						
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Water birch / roses	*Betula occidentalis / Rosa* spp.	-	-	Red	Yes	X
Seacoast bulrush Alkali Marsh	*Bolboschoenus maritimus* var. *paludosus* Alkali Marsh	-	-	Red	Yes	X
Alkali saltgrass herbaceous vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X
Trembling aspen / mock-orange	*Populus tremuloides / Philadelphus lewisii*	-	-	Red	Yes	X
Trembling aspen / common snowberry / mountain sweet-cicely	*Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi*	-	-	Red	Yes	X
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Black cottonwood - water birch	*Populus trichocarpa - Betula occidentalis*	-	-	Red	Yes	X
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / Douglas maple - red-osier dogwood	*Pseudotsuga menziesii / Acer glabrum - Cornus stolonifera*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / snowbrush	*Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / Idaho fescue	*Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	-	-	Blue	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / needle-and-thread grass	*Purshia tridentata / Hesperostipa comata*	-	-	Red	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Long-awned three-square bulrush Alkali Marsh	*Schoenoplectus pungens* var. *longispicatus* Alkali Marsh	-	-	Red	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / red-osier dogwood	*Thuja plicata - Pseudotsuga menziesii / Cornus stolonifera*	-	-	Blue	Yes	X
Western redcedar - Douglas-fir / false Solomon's seal	*Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum*	-	-	Red	Yes	X
Common cattail Marsh	*Typha latifolia*	-	-	Blue	Yes	X

Notes: Ecological communities were not assigned a risk ranking, potential to occur was indicated based on the known occurrence of a particular community within one or more of the BEC subzone(s) overlapped by the Project study area.

3.5.5 Wildlife

The COL LTL 219 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved UWRs, WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). The wildlife habitat present within the study area includes areas of native grassland, areas of low shrub cover, and riparian habitats. Additionally, much of the area study area is overlapped by mowed non-native grass (i.e., lawn) and planted trees associated with the Vernon Golf and Country Club and Kalamalka Research station. The habitat present within the study area may provide foraging habitat and movement corridors for a variety of wildlife, including species of concern.

The desktop studies identified ten wildlife species of concern with medium or high potential to occur within the study area (**Table 3.35**). Two of these species have known occurrences within the study area of the lateral, and a third within the study area for the proposed PRS station. Three species have federally designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.36**). One or more instances of mapped masked (i.e., confidential) CDC occurrences overlap the study area (DataBC 2018). Three nearby occurrences (ID #s 7978, 6621, and 10427) were identified by BC CDC as potentially vulnerable to Project activities (Stipec, K. pers.comm. 2018). Due to the sensitive nature of the species, and to ensure compliance with data-sharing agreement policy with the BC CDC, the identity of the species of concern and their location are not identified in this report. Based on review of the information provided by the BC CDC, these occurrences are not anticipated to be directly impacted by Project activities, however it is recommended that BC CDC is contacted prior to construction to better understand if any mitigation is required prior to construction. No observations of wildlife or wildlife habitat features were identified in the areas assessed during the PFR.

Table 3.35 Wildlife of Concern with Medium or High Potential to Occur in the COL LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	Medium
Western Screech-Owl, *macfarlanei* subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium
Reptiles							
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	1-T (Jan 2005)	T (Apr 2013)	Blue	Yes	-	High

Table 3.36 Wildlife of Concern with Known Occurrences or Critical Habitat in the COL LTL 219 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	2,561,632	Designated Critical Habitat encapsulates the range of the American Badger population in the Okanagan-Boundary subpopulation and overlaps the entire lateral and location of PRS Stations (CDC 2018)	-	-	-
Great Basin Spadefoot	N/A	N/A	Occurrence is near the PRS Station at west end of COL LOP 168, not within the study area for the lateral (CDC 2018)	Overlaps	1,698,577	Federally-designated (final status) polygon overlaps with southern portion of study area lateral from its south end to approximate chainage 0+4. Within polygon, core connective critical habitat is identified where the following biophysical features and attributes are present: grassland, shrub-steppe, open forest, potentially including human-modified habitats such as urban and agricultural areas (ECCC 2017*b*))
Gopher Snake, *deserticola* subspecies	319	18,469	Several occurrences of gopher snakes on Middleton mountain, three of which overlap with the east side of the study area (CDC 2018)	Overlaps	1,952,917	Federally-designated (proposed status) polygon overlaps with eastern portion of study area and almost entire length of lateral. Within polygon, core critical habitat is identified where the following biophysical features and attributes are present: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, open coniferous forest, riparian areas and wetland habitat. (ECCC 2017*c*) Some of identified critical habitat in study area is on federal land (in northwest portion of study area)

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Western Rattlesnake	-	-	-	Overlaps	1,733,095	Federally-designated (proposed status) polygon overlaps with southern portion of study area and southern-most approximately 1.3 km of the lateral. Within polygon, critical habitat is identified where the following biophysical features and attributes are present: cliff, talus, rock outcrop, earth covered rock outcrop, rock piles or large rocks, grassland, shrub-steppe, open coniferous forest, riparian areas, and wetland habitat (ECCC 2017*c*). Some of identified critical habitat in study area is on federal land (in northwest portion of study area)

3.6 KE1 LOP 219

KE1 LOP 219 is 2.1 km long and is aligned in an approximately east-west direction through Kelowna, BC. The proposed pipeline upgrade option for this lateral is PRS. The PFR was conducted on May 23, 2018 and was restricted to the proposed PRS Site #7, which is located in a Walmart parking lot at the east end of the lateral. The west end of the lateral was also assessed due to the presence of known APEC. Vehicle access to the west end was obtained from Spall Road; which is adjacent to a commercial/industrial area and community green space. Vehicle access to the east end was from Enterprise Way. Maps pertaining to this lateral are located on **Figures TO-37** to **TO-38** (**Appendix A**).

Representative photos were captured at both sites. An overview of the identified environmental receptors within the study area is provided in **Sections 3.6.1** to **Section 3.6.5**.

3.6.1 Land Use

The lateral passes through a mix of urban park land and industrial and commercial properties. The proposed PRS is located at the east end of the lateral in a Walmart parking lot. A summary of the land use within the study area is provided in **Table 3.37**:

Table 3.37 Overview of Land Use within the KEI LOP 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Municipal: 18.8 **Private:** 16.9 **Unknown**: 1.9	Central Okanagan	City of Kelowna	Lateral crosses Mill Creek Linear Park and Enterprise Park, municipal parks with trails for walking and dog-walking Lateral also crosses Natural Environment Development Permit Areas for watercourses and vulnerable groundwater aquifers. Natural Environment Development Permit Areas for sensitive ecosystems and sensitive drainage areas overlap with the northern part of the study area(City of Kelowna 2018)	-	N/A	N/A

3.6.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along the KEI LOP 219 lateral are provided in **Table 3.38**.

Table 3.38 Summary of Areas of Environmental Concern for Lateral KEI LOP 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
KEI LOP 219 (PRS)							
R1	Various auto dealerships (2530 – 2590 Enterprise Way, Kelowna)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Aerial imagery	Adjacent	Medium	515	TO-38
R2	Western Star Trucks – vehicle maintenance (2076 Enterprise Way, Kelowna)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Site Reg (ID 4210)/NPRI	60 m northeast	Low	185	TO-37
R3	Interlink Freight System – vehicle fueling (including UST) and maintenance. C of C issued in 2005. (2046 Enterprise Way, Kelowna)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Site Reg (ID 3966)	Adjacent	Low	130	TO-37
R4	FortisBC pump station – Site Registry entry noting mercury contamination (1595 Spall Road, Kelowna)	Mercury	Site Reg (ID 2475)	On-Site	High	60	TO-37
R5	Machinery parking and storage area (Spall Road, Kelowna)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Aerial imagery	On-Site	Low	35	TO-37
R6	Fortis transformer station (1535 Spall Road, Kelowna)	BTEX/VPH, EPH, PAHs, PCBs, metals	Aerial imagery	Adjacent	Low	50	TO-37

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VPH – Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

3.6.3 Fish and Fish Habitat

One watercourse, which crosses the KE1 LOP 219 lateral at three locations, was identified during the desktop assessment. This watercourse was not assessed during the preliminary field reconnaissance because the preferred engineering alternative is PRS and this watercourse is not expected to interact with PRS construction activities.

The City of Kelowna requires development within their Natural Environmental Development Permit Areas to comply with RAR setbacks (**Section 4.5.2**). The PRS construction footprint should remain outside the 30m required watercourse setback.

City of Kelowna data was used to summarize the watercourse attributes in **Table 3.39** the biophysical description is available in **Appendix C**.

Table 3.39 Summary of Waterbodies within the KEI LOP 219 Study Area

Watercourse ID	Type	Distance from Lateral (m)	Fish Bearing	Mapped Watercourse	SPEA[1]	Figure Reference
TO_KE1 LOP 219_001 (Mill Creek/ Kelowna Creek)	Stream - Permanent	0	Yes	Yes: FWA and Kelowna_ Streamline	15 - 30	TO-38 TO-39

[1] Calculated from a Simple Assessment.

Notes: 0 = crosses lateral

3.6.4 Vegetation

The KE1 LOP 219 study area is located within the PPxh subzone. Vegetation cover in the study area was limited due to the urban setting, and was generally composed of grassland, manicured lawns, street trees, and the riparian vegetation along Mill Cree, which is predominantly deciduous trees (e.g., balsam polar (*Populus balsamifera ssp. balsamifera*) and willow (*Salix spp*.)).

One small site of invasive hound's-tongue (*Cynoglossum officinale*) which covered approximately 3 m^2 was identified during the desktop search in Mill Creek Linear park near the east end of the lateral (**Figure TO-38**). No additional sites of invasive vegetation were identified during the PFR.

Desktop studies identified four plant species of concern with medium potential to occur in the study area and 35 at-risk ecological communities that occur within the BEC subzone overlapped by the study area (**Table 3.40**). None of these species or ecological communities has critical habitat identified within the study area. Two ecological communities are mapped by DataBC as occurring along the riparian corridor of Mill Creek (DataBC 2018) (**Figures TO-37** to **TO-38**). Both occurrences are based on existing Terrestrial Ecosystem Mapping and were not confirmed by field investigation.

- Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood community: This occurrence is crossed by the lateral several times and overlaps with approximately 195,894 m2 of the study area
- Two areas of Common Cattail Marsh are located along the banks of Mill Creek within the study area; the closest is located 3 m from the lateral alignment, and the other is mapped approximately 330 m northeast of the lateral. In total, these two occurrences overlap with 11,668 m^2 of the study area

Table 3.40 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the KE1 LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Giant helleborine	*Epipactis gigantea*	3	NAR (Nov 2015)	Yellow	Yes	Medium
Mexican mosquito fern	*Azolla mexicana*	1-T (Jun 2003)	T (Nov 2008)	Red	Yes	Medium
Showy phlox	*Phlox speciosa* ssp. *occidentalis*	1-T (Aug 2006)	T (Nov 2004)	Red	Yes	Medium
Nonvascular Plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	Medium
Ecological Communities						
Big sagebrush / bluebunch wheatgrass	*Artemisia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Threetip sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	*Artemisia tripartita / Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Red	Yes	X
Water birch / roses	*Betula occidentalis / Rosa* spp.	-	-	Red	Yes	X
Seacoast bulrush alkali marsh	*Bolboschoenus maritimus* var. *paludosus*	-	-	Red	Yes	X
Alkali saltgrass herbaceous vegetation	*Distichlis spicata var. stricta Herbaceous Vegetation*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Baltic rush - common silverweed	*Juncus balticus - Potentilla anserina*	-	-	Red	Yes	X
Ponderosa pine / red three-awn	*Pinus ponderosa / Aristida purpurea* var. *longiseta*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Ponderosa pine / bluebunch wheatgrass	*Pinus ponderosa / Pseudoroegneria spicata*	-	-	Blue	Yes	X
Ponderosa pine / bluebunch wheatgrass - rough fescue	*Pinus ponderosa / Pseudoroegneria spicata - Festuca campestris*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass - Idaho fescue	*Pinus ponderosa / Pseudoroegneria spicata - Festuca idahoensis*	-	-	Blue	Yes	X
Ponderosa pine / bluebunch wheatgrass - silky lupine	*Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus*	-	-	Red	Yes	X
Ponderosa pine / common snowberry / bluegrasses	*Pinus ponderosa / Symphoricarpos albus / Poa spp.*	-	-	Red	Yes	X
Trembling aspen - black cottonwood / common snowberry / common horsetail	*Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense*	-	-	Red	Yes	X
Trembling aspen / common snowberry / Kentucky bluegrass	*Populus tremuloides / Symphoricarpos albus / Poa pratensis*	-	-	Red	Yes	X
Black cottonwood - water birch	*Populus trichocarpa - Betula occidentalis*	-	-	Red	Yes	X
Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	*Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus stolonifera*	-	-	Red	Yes	X
Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir - water birch / Douglas maple	*Pseudotsuga menziesii - Betula occidentalis / Acer glabrum*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / mallow ninebark	*Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus*	-	-	Red	Yes	X
Douglas-fir / common snowberry - saskatoon	*Pseudotsuga menziesii / Symphoricarpos albus - Amelanchier alnifolia*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Douglas-fir / common snowberry / pinegrass	*Pseudotsuga menziesii / Symphoricarpos albus / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir / common snowberry - birch-leaved spirea	*Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia*	-	-	Blue	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / needle-and-thread grass	*Purshia tridentata / Hesperostipa comata*	-	-	Red	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus*	-	-	Blue	Yes	X
Long-awned three-square bulrush alkali marsh	*Schoenoplectus pungens* var. *longispicatus*	-	-	Red	Yes	X
Compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	*Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia*	-	-	Blue	Yes	X

Notes: Ecological communities were not assigned a risk ranking, Potential to occur was indicated based on the known occurrence of a particular community within one or more of the BEC subzone(s) overlapped by the Project study area.

3.6.5 Wildlife

The KE1 LOP 219 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved WHAs, or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). The entire study area is located within an Ungulate Wintering Range (# U-8-8001, of which the focal management species is mule deer). Habitat within the study area has been highly modified by anthropogenic activity; however, Mill Creek and the area of associated riparian vegetation may provide foraging and breeding habitat, and a movement corridor for dispersal for a variety of wildlife, including species of concern. Wildlife habitat value at the proposed PRS (#7) is limited, as this area is paved over and human presence is high.

Desktop studies identified eight wildlife species of concern with medium or high potential to occur within the study area (**Table 3.41**). Two of these species have known occurrences within the study area and one has federally designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.42**). No instances of mapped masked (i.e., confidential) CDC occurrences overlap the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during the PFR (which was limited to both ends of the lateral).

Table 3.41 Wildlife of Concern with Medium or High Potential to Occur in the KE1 LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	Medium
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	Medium
Western Harvest Mouse	*Reithrodontomys megalotis*	1-SC (Mar 2009)	SC (Apr 2007)	Blue	Yes	-	Medium
Birds							
Common Nighthawk	*Chordeiles minor*	SC (June 2018)	SC (April 2018)	Yellow	-	-	Medium
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	Medium
Reptiles/turtles							
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	1-T (Jan 2005)	T (Apr 2013)	Blue	Yes	-	Medium
North American Racer	*Coluber constrictor*	1-SC (Aug 2006)	T (Nov 2015)	Blue	Yes	-	Medium

Table 3.42 Wildlife of Concern with Known Occurrences or Critical Habitat in the KE1 LOP 219 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	2,765,011	Designated Critical Habitat encapsulates the Thompson range of the American Badger population and overlaps entire lateral. (CDC 2018).	-	-	-
Gopher Snake, *deserticola* subspecies	-	-	-	Overlaps	1,666,493	Federally designated (proposed status) polygon overlaps central portion of study area, and with the lateral from its east end to approximate chainage 1+8. Within polygon, core critical habitat is identified where the following biophysical features and attributes are present: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, open coniferous forest, riparian areas and wetland habitat. (ECCC 2017*c*)
North American Racer	Overlaps	12,668	Occurrence consists of two observations from 2011, one near the railway tracks west of Dilworth Dr, and one on the south side of the lateral near chainage 0+50 (CDC 2018)	-	-	-

4.0 REGULATORY OVERVIEW

This section provides an overview of the environmental legislation, regulations, and bylaws that apply to the Project. A list of environmental permits and approvals that are expected to be required for each lateral is provided in the Project Risk Assessment section for that lateral (**Section 5.0**).

4.1 Federal Legislation

4.1.1 Fisheries Act

Section 35 of the *Fisheries Act* (2012) requires that "*no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery*". Serious harm is defined in the *Act* as, "*the death of fish or any permanent alteration to, or destruction of, fish habitat*". Projects "*can proceed only if there is a low likelihood and low uncertainty regarding both the death of fish and a net negative residual impact on* [fish] *habitat, prior to considerations of any offsetting activities*" (DFO 2014). Proponents must avoid or mitigate serious harm to fish. If serious harm cannot be avoided or mitigated, the Project would require an authorization under sub-Section 35(2) of the *Fisheries Act*. Other sections of the *Fisheries Act* that are applicable to the Project include Section 36(3) that prohibits the deposition of deleterious substances to waters frequented by fish, and Sections 38(4) and 38(5) that require a contravention of either Sections 35 or 36(3) be reported without delay.

4.1.2 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (SC 1994, c.22) protects various species of migratory birds including gamebirds, insectivorous birds, and non-gamebirds. The Act prohibits the taking of migratory bird nests and the deposit of harmful substances in waters or areas frequented by migratory birds. The provincial *Wildlife Act* described in **Section 4.3** encompasses most bird species not covered under the *MBCA*.

4.1.3 Species at Risk Act

The primary objective of the *Species at Risk Act* (SC 2002, c. 29) is to prevent species at risk from becoming extirpated or extinct, and to ensures appropriate management of species of special concern to prevent them from becoming threatened or endangered (Government of Canada 2002). Under SARA, protection is afforded to individuals, residences, and in some cases federally-designated critical habitat of species listed in Schedule 1 as "endangered", "threatened" or "extirpated". Several of the study areas for the Project alignments have federally-designated critical habitat identified within them; further details are provided in the Overview of Existing Environment sections for each alignment (**Section 3.0**).

Section 73 permits are required by anyone conducting activities that may violate SARA prohibitions by intentionally or inadvertently killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling or trading of individuals of endangered, threatened and extirpated species listed in Schedule 1 of the Act. The Act also contains a prohibition against the damage or destruction of residences (e.g., nest or den) of species listed on Schedule 1 of SARA. The Species at Risk Public Registry (Government of Canada 2018) outlines that Section 73 permits would be required where a violation to the prohibitions of SARA are anticipated for listed species that are:

- Found on federal lands in a province, or on lands in a territory under the authority of the Minister of the Environment or of the Parks Canada Agency

- Migratory birds protected by the MBCA, anywhere they occur, including private lands, lands in a province and lands in a territory
- Aquatic species anywhere they occur, including private lands, lands in a province and lands in a territory

SARA (Section 58) also contains a prohibition against destroying any part of the critical habitat of any listed endangered or threatened species, or of any listed extirpated species if a recovery strategy has recommended its reintroduction, if the:

- Critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada
- Listed species is an aquatic species
- Listed species is a species of migratory birds protected by the MBCA

4.2 Provincial Legislation (British Columbia)

4.2.1 Oil and Gas Activities Act

The BC *Oil and Gas Activities Act* (SBC 2008, c. 36) (OGAA) sets out a regulatory framework under which the Oil and Gas Commission (OGC) governs oil and gas activities within the province. The OGAA was brought into effect to consolidate and modernize the requirements that previously existed for oil and gas projects under several acts and regulations. Section 8 of the OGAA gives the Oil and Gas Commission power to make decisions under several pieces of other provincial legislation instead of the statutory decision maker with the mandate to implement that legislation. Under existing legislation, which consists of the OGAA itself and several regulations passed under the Act, the OGC has an established structure for the protection of environmental resources, and a range of compliance and enforcement abilities.

The Environmental Protection and Management Regulation (EPMR), which applies to surface Crown land, provides the OGC with the authority to manage and protect environmental values on provincial Crown land. Key environmental values that require management and protection are identified as Government's Environmental Objectives under Part 2 of the EPMR.

4.2.2 BC Environmental Management Act

The BC *Environmental Management Act* (SBC 2003, c. 53) provides requirements for the regulation of activities that introduce waste into the environment, store special waste, and treat or recycle special waste. This Act establishes the Contaminated Site Regulation (CSR), Hazardous Waste Regulation (Government of BC 1988), Clean Air Provision, the Spill Reporting Regulation (Government of BC 1990), and the Oil and Gas Waste Regulation (Government of BC 2005) and provides a permitting system to enable the authorized disposal of solid waste (including soil), discharge of emissions, and discharge of waste water (including hydrostatic test water), and surface run-off.

Part 8 of the CSR (including the most recent amendments to the EMA under B.C. Reg. 196/2017, October 31, 2017) identifies the requirements for contaminated soil relocation when considering the receiving site. If the industrial use standards, or applicable standards of the receiving site are exceeded, the soil is considered contaminated and a Contaminated Soil Relocation Agreement or disposal at a permitted facility will be required. As such, if suspect contaminated soil is encountered during trenching /

construction and needs to be removed from site (e.g., for geotechnical reasons), characterization will be required to ensure relocation is completed appropriately.

4.2.3 Land Act

The *Land Act,* RSBC 1996 c. 245) is the primary legislation used by government to permit the use of Crown land by communities, industry and businesses. The Act allows the granting of land, and the issuance of Crown land tenure in the form of leases, licences, permits and rights-of-way.

Section 8 of the OGAA allows the OGC to administer the following sections of the Land Act: Section 11 (disposing of Crown land), Section 14 (temporary occupation of Crown land), section 38 (lease of Crown land), Section 39 (licence of occupation), Section 40 (right of way and easement), and Section 96 (occupational rental).

4.2.4 Agricultural Land Commission Act

The BC *Agricultural Land Commission Act* (SBC 2002, c. 36) sets the legislative framework for the establishment and administration of the agricultural lands preservation program. The Act is meant to protect agricultural land within the province. Under the Act, this land is designated as ALR.

The Agricultural Land Commission (ALC) is the agency responsible for the administration of the ALR. The OGC has a delegation agreement with the ALC that gives the OGC authority to permit oil and gas activities in the ALR. Land must be reclaimed to its pre-development agricultural condition when no longer required for an oil or gas activity.

4.2.5 Water Sustainability Act

The BC *Water Sustainability Act* (SBC 2014, c. 15) (WSA) is the principal legislation for managing the diversion and use of water resources. Section 8 of the OGAA allows the OGC to administer both Sections 10 and 11 of the WSA, including issuing change approvals and use approvals.

For changes in and about a stream, an application for a Change Approval or submission of a Notification is required under Section 11 of the *WSA*. Under the WSA, a stream is defined as "(*a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the channel of the stream has been modified, or (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer".*

Changes in and about a stream are defined in the WSA as:

- Any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream
- Any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel

4.2.6 Forest and Range Practices Act

The *Forest and Range Practices Act* (SBC 2002 c. 69) (FRPA) outlines how forest and range practices and resource-based activities are to be conducted on Crown land. It also addresses the protection of plants, animals and ecosystems while undertaking these resource-based activities.

Forestry and range land use management guidelines for wildlife are established by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development under FRPA. Under FRPA and the Government Actions Regulations (Government of BC 2004), ungulate winter ranges, general wildlife measures, and wildlife habitat areas can be established for specified areas and for specified species to set objectives with respect to acceptable forest and range practices in these areas.

4.3 Wildlife Act

In general, the BC *Wildlife Act (*RSBC 1996, c. 488*)* provides a regulatory framework for the management of wildlife and, in very limited circumstance and limited to a few specifically designated species, wildlife habitat (i.e., bird nests) in the province. The *Wildlife Act* protects most native vertebrates from direct harm or harassment, regulates hunting, trapping and sport fishing, protects nesting birds and active nests that are occupied by a bird or its egg(s). The nests of some bird species are afforded specific consideration under Section 34b of the *Wildlife Act* regardless of whether they are occupied. These protected nests, as relevant to this Project, include those used seasonally by peregrine falcon, burrowing owl, bald eagle, osprey, and great blue heron.

A general *Wildlife Act* permit is required for any trapping or handling of live wildlife (i.e., salvages), including species at risk.

4.4 Weed Control Act

The BC *Weed Control Act*, RSBC 1996, c.487, aims to control the spread of designated noxious plants on all provincial Crown and private land. There is an obligation under the *Act* for the land occupier to control these designated noxious plants. The *Act* requires all land occupiers to avoid establishment and dispersal of noxious weeds as defined by the *Act*.

4.5 Riparian Areas Protection Act

The *Riparian Areas Protection Act* (SBC 1997 c. 21) and associated Riparian Areas Regulation (RAR) direct local governments to protect riparian areas during new residential, commercial and industrial development. Local governments must either include riparian area protection provisions in its zoning bylaws and permits in accordance with the RAR or ensure that its bylaws and permits meet or exceed the RAR. The RAR applies only to the regional districts specified in Section 3 of the regulation, including the Thompson-Nicola, Columbia-Shuswap, North Okanagan and Central Okanagan Regional Districts.

4.6 Regional Bylaws

The Regional District of North Okanagan Zoning Bylaw (*No. 1888, 2003)*, Section 301 (1) states that development such as gas pipelines within a designated right or way within the ALR shall not be allowed unless permitted, explicitly by the bylaw. Development within ALR land is also subject to the *Agricultural Land Commission Act* and its regulations (RDNO 2003).

No applicable regional-level bylaws were identified for the Thompson-Okanagan, Central Okanagan or Columbia Shuswap Regional Districts.

4.7 Municipal Bylaws

4.7.1 City of Kamloops

Riparian Areas Regulation Development Permit Area - By-law No. 5-1-2273

According to this bylaw, a Development Permit is required for all activity defined as development under the RAR that is located within 30 m of the high watermark or top of a stream's ravine bank. This Development Permit Area applies to all privately-owned land abutting the North and South Thompson Rivers, Kamloops Lake, all their tributaries, and all waterbodies containing fish habitat within the City of Kamloops. No watercourses occur within the KA1 LTL 168 or KA1 LOP 168 study areas.

Tree Protection Bylaw No. 50-1, 2017

The City of Kamloops *Tree Protection* Bylaw states that no person shall cut down any tree or permit a tree to be cut down or undertake any tree-damaging activity or permit any tree-damaging activity unless a Tree Cutting Permit has been acquired prior to the activity. It is expected that the Project will require a tree cutting permit prior to construction.

Earthworks Control Bylaw No. 4-19,1981

This bylaw states that a person shall not move, deposit or remove soils, from any lands within the City without obtaining an Earthwork Permit from the Chief Building Inspector unless that person is excluded per Section 4 of the bylaw. The City of Kamloops should be consulted to determine if an Earthworks Permit is required prior to construction.

Sanitary Sewer Bylaw No. 32-35

The City's *Sanitary Sewer Bylaw* stipulates a no person shall discharge or cause to be discharged any stormwater, surface water, groundwater or industrial waste water into the City's sanitary system without a Discharge Permit.

4.7.2 City of Kelowna

Natural Environment Development Permit Area, Development Application Procedures Bylaw No. 10540

Projects falling within the City's Natural Environmental Development Permit Area along Mill Creek will require a Development Permit before activities such as alteration to land (including but not limited to clearing, grading, blasting, preparation for or construction of services), roads and trails take place. The Natural Environmental Development Permit Guidelines should be consulted when developing the permit application. Projects must also comply with Riparian Management Area setbacks.

Tree Protection Bylaw No.8041

The City's *Tree Protection Bylaw* regulates the removal or protected trees in Natural Environmental/ Hazardous Condition Development Permit Areas. This states that a Tree Cutting Permit must be obtained before a tree is removed or damaged.

Soil Removal and Deposit Regulation Bylaw No. 9612

According to the City's Soil Removal and Deposit Regulation no person shall deposit or remove soil or undertake any action which results in the deposit or removal of soil, on any land within the City until a permit for such deposit or removal has been obtained. Exemptions include:

- Activities that are in accordance with a valid Building Permit, Development Permit, and/or approved Site Grading Plan
- Activities that Involve the movement of existing soil within the boundaries of a single legal parcel
- Activities that involves less than 50 m3 of soil per parcel of land per calendar year
- Activities that are required to create or maintain a private service corridor as defined in the bylaw

We anticipate the Project is exempt from a soil removal and deposit permit form the City of Kelowna.

Development and Servicing Bylaw 7900

Section 3.5 for the *Development and Servicing Bylaw* states that all proposed projects must provide erosion and sedimentation controls to prevent the displacement of soil and the transport of sediment from the project site resulting from land disturbing activities. To prevent the displacement of soil and the sediment transport during land-disturbing activities, erosion and sedimentation control (ESC) measures are required. Both temporary and permanent erosion and sedimentation controls shall be implemented.

Sanitary Sewer/Storm Drain Regulation Bylaw No. 6618-90

The Sanitary Sewer/Storm Drain Regulation Bylaw states that no person shall discharge or allow or cause to be discharged into a storm drain, any substance except storm water or aperture draining into the storm drain system, any water or substance which:

i. Has a temperature differential of +/- 5 degrees of background
ii. May impair the quality of the water in any well, lake, river, pond, spring, stream, reservoir or other water or watercourse
iii. Would exceed those parameters as listed in "BC Approved Water Quality Guidelines, 2006 Edition"
iv. Induced suspended sediment concentrations should not exceed background levels by more than 25 mg/L at any time when background levels are between 25 and 250 mg/L. When background exceeds 250 mg/L, suspended sediments should not be increased by more than 10% of the measured background level at any one time

4.7.3 City of Vernon

Environmentally Sensitive Area Strategy and Development Permit Areas, Official Community Plan 2013 Bylaw No. 5470

The City of Vernon's Environmentally Sensitive Area Strategy identifies Environmental Management Areas that stipulate considerations and permitting requirements for development near natural features. A Development Permit may be required for development in proximity to riparian areas in the City of Vernon. In addition, development in these areas must be carried out in accordance with the Environmental Management Areas Strategy Implementation Guidelines and the Riparian Areas Regulation.

Tree Protection Bylaw No. 4152

Per the City's *Tree Protection Bylaw*, no person shall damage, destroy or remove any tree, the stem of which exceeds 8 centimetres (cm) at 1 m above the above ground level of the base of the trees without a Tree Cutting Permit. Exemptions apply to the removal or damage of hazardous trees by a utility company. The bylaw also states that no person shall be issued a permit to destroy a tree growing within 15 metres of the natural boundary of a watercourse, except where a tree or the roots of a tree are blocking a watercourse or reducing its drainage capacity. Tree removal may be permitted where it is necessary for work carried out under a WSA Approval or Notification.

Soil Removal and Deposition Bylaw No. 5259

The City of Vernon's *Soil Removal and Deposition Bylaw* restricts the removal of soils, deposition of soil, or the undertaking of any action which results in the removal or deposition of soil, on any land within the City including land within a Riparian Assessment Area or an Environmentally Sensitive Area, unless a permit has first been issued by the Director of Community Infrastructure and Development.

4.7.4 City of Armstrong

City of Armstrong Development Permit Area Bylaw No. 1750

Natural Environment Development Permit Areas are identified within the City of Armstrong's Official Community Plan. Development projects such as utility corridors within Natural Environment Development Permit Areas require a permit prior to altering, developing or subdividing the lands within the permit area. SAL LOP 168 crosses a Natural Environment Development Permit Area within the City of Armstrong, so a Development Permit would be required.

Soil Deposit and Removal Bylaw No. 1791

The City's Soil Deposit and Removal Bylaw states that no person shall deposit or remove more than 76 m^3 of soil, rock, or fill onto or from any land within the City without a Building Permit.

4.7.5 District of Coldstream

Riparian Development Permit Area, Official Community Plan Bylaw No. 1673 and No. 952

Development located within areas designated as Riparian Development Permit Areas are required to obtain a Watercourse Development Permit per the RAR and Watercourse Development Area Permits guidelines and Official Community Plan.

Soil Removal and Deposit Bylaw No. 1629, 2013

Pursuant to this bylaw, no person will cause or permit the removal or deposit of soil greater than 50 m^3 on any land within the District of Coldstream unless a permit has been granted. Furthermore, no person will cause or permit the removal or deposit of soil on any land within the ALR unless the ALC grants written approval or exemption under the *Agricultural Land Commission Act* to the District of Coldstream.

Tree Management Bylaw No. 1198, 1995

The District's Tree Management bylaw contains prohibitions as well as protected tree species. Prohibitions contained within the bylaw include:

a. No person shall cut down or caused to be cut down a protected tree without first obtaining a permit issued pursuant to this bylaw
b. No person shall damage, or caused to be damaged, a protected tree
c. No person shall carry out or cause to be carried out any of the following activities in respect of a protected tree:
    1. cut or damage the roots of the tree within the tree's drip line;
    2. place fill, building materials, paving or a building or structure upon land inside the drip line;
    3. operate heavy equipment or vehicles over the roots of the tree within the drip line
    4. damage or deface the trunk
    5. remove the bark
    6. deposit a substance harmful to the health of the protected tree on land within the drip line
    7. remove soil from land inside the drip line
    8. damage a protected tree in any manner which will jeopardize the health of the protected tree

Exemptions are listed for certain circumstances. A tree cutting permit is required to cut down or remove a tree per Section 6 of the bylaw.

Sanitary Sewer System Regulation and Rate Bylaw No. 1692, 2017

Pursuant to the Sanitary Sewer System Regulation and Rate Bylaw, a person must not release or discharge, or cause, suffer or allow the release or discharge into the sanitary sewer system of any waste described in Schedule A as prohibitive waste which includes any stormwater.

4.7.6 City of Salmon-Arm

Environmentally Sensitive Riparian Areas Development Permit Area, Official Community Plan Bylaw No. 4000

Map 5.2 within the OCP shows designated Environmentally Sensitive Riparian Development Permit Areas. These areas are equivalent to the riparian assessment area of the RAR. Development within the designated areas requires a Development Permit wavier to be issued prior to alteration of the land, subdivision and or construction of, addition to, or alteration of a building or structure.

City of Salmon Arm Subdivision and Development Servicing Bylaw No. 4163

Section 3.1 of the City's Subdivision and Development Servicing Bylaw states that ESC plans are required as part of the submission set for all development proposals where ground disturbance is proposed. The ESC Plan should seek to protect soil surface from erosion where practicable and capture all sediment on-site during each phase of construction.

Tree Removal Protection Bylaw No. 2305

The City of Salmon Arm's Tree Protection Bylaw prohibits the cutting down, removal or damage of trees except where permitted and in accordance with the bylaw. Exceptions include trees that are deemed hazardous to persons or property and trees that have a minimum trunk circumference less than 31.5 cm measured at 1.5 meters above the level of the ground as well as those exceptions listed in Section 3 of the bylaw.

Sewer Connection Bylaw No. 1410

Per the City's Sewer Connection Bylaw, no person shall discharge into any ditch, drain, creek, stream, watercourse, waterway, lake or bay, without first obtaining permission. Where no sewer is available the Superintendent may grant permission for the discharge to or into any ditch, drain, creek, stream, watercourse, waterway, lake or bay, subject to such standards of quality, quantity and rate of discharge.

4.7.7 Township of Spallumcheen

Water Body Protection – Natural Environment Development Permit Area, Official Community Plan Bylaw No. 1794, 2011

Pursuant to the Township of Spallumcheen, all lands within 30 meters of the high-water mark of Shuswap River, Deep Creek, Fortune Creek, Maid Creek, Otter Lake and all other mapped and unmapped streams as shown on Schedule C of the OCP are designated as Water Body Protection – Natural Environment Development Permit Areas. Per the bylaw, development such as disturbance of soils, removal, alteration, disruption of vegetation and the development of a utility corridor require a development permit; however, it is expected that a Development Permit will no be required as an Approval or Notification under the WSA would supersede the municipal requirements.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS AND RISKS

This section provides a high-level overview of the potential adverse effects to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities[6] (i.e., where the anticipated construction footprint overlaps with identified features), and where factors present a risk to the Project. For the purposes of this report, risks to the Project include additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals).

Potential Project risks are identified and ranked for land use, surface water quantity and quality, fish and fish habitat, vegetation (including species at risk), wildlife (including species at risk), and contaminated soils and/or groundwater. This represents an expanded list of environmental receptors compared to those considered in the Overview of the Existing Environment (**Section 3.0**), as surface water quantity and quality are also included. These environmental receptors were grouped into two categories as follows:

1. Biophysical receptors:
   - Land use:
     - Presence and potential disturbance to parks and protected areas
     - Presence and potential disturbance of ALR, with consideration to agricultural capability of soils
   - Surface water quantity and quality:
     - Presence of surface water, and potential for contamination or modification to surface water flow
   - Fish and fish habitat:
     - Presence of and potential disturbance and modification of fish habitat
   - Vegetation:
     - Presence and potential for spread of invasive vegetation
     - Presence and potential disturbance to areas of natural vegetation
     - Presence and potential for disturbance to plant species and communities of concern
   - Wildlife and wildlife habitat:
     - Presence of and potential disturbance to wildlife species noted to be of concern and to associated wildlife habitat features
     - Presence of designated critical habitat
2. Contaminated Soils/Groundwater:
   - Risk Areas along each lateral were there is a medium or high risk of soil and/or groundwater contamination present and intrusive work (i.e., ground disturbance) is recommended to confirm the presence and extent of the contamination. These areas are considered to pose a risk to the Project during construction activities related to soil and groundwater management. The list of Risk Areas for each lateral was further refined by removing identified APECs where contaminated soil, if encountered, will likely be reused as fill or spread within the ROW, resulting in a reduced risk to the Project

6 For laterals with ILI as the alternative upgrade option, overlap of sensitive features

Follow-up activities are recommended to address or mitigate risks associated with each receptor. Additionally, a separate list of permits and approvals that are expected to be required, along with the estimated timeframe for issuance, is provided for the preferred and alternate upgrade option of each lateral.

5.1 KA1 LTL 168 and KA1 LOP Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.1.3**.

5.1.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.1**.

Table 5.1 Overview of Potential Effects and Risks to Biophysical Receptors Associated with KA1 LTL 168 and KA1 LOP 168

Environmental Receptor	Preferred Option (PLR)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Kenna Cartwright Nature Park, particularly in areas where lateral crosses or runs adjacent to existing trails and park infrastructure • Areas designated by City of Kamloops as Grassland Priority Areas • North end of KA1 LTL 168 alignment is in the immediate vicinity of CN railway	• Temporary disruption of recreational use, potential trail closure during construction • Temporary impact to area designated Grassland Priority Area during construction • Potential challenges to construction access and timing related to railway use and industrial traffic	High	• Public engagement • Site restoration • Engagement with CN railway	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Kenna Cartwright Nature Park, particularly in areas where lateral crosses or runs adjacent to existing trails and park infrastructure • Areas designated by City of Kamloops as Grassland Priority • Construction zones for KA1 LTL 168 that are in the immediate vicinity of the CN railway	• Temporary disruption of recreational use, potential trail closure during construction • Temporary impact to area designated Grassland Priority Area during construction • Potential challenges to construction access and timing related to railway use and industrial traffic	• High	• Public engagement • Site Restoration • Engagement with CN railway
Surface Water Quality and Quantity	• Drainage swale and potential watercourse identified during PFR (TO_KA1 LTL 168_006, TO_KA1 LTL 168_007)	• Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.)	Low	• Develop and implement an EMP and conduct environmental monitoring • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation	• Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • Potential watercourse crossings or works sites within watercourse SPEAs	• Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.)	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• None	• No fish habitat is present within study area; therefore, no adverse effects anticipated	Nil	• N/A	• None	• No fish habitat is present within study area; therefore, no adverse effects anticipated.	Nil	• N/A
Vegetation	• Areas of mature native vegetation adjacent to lateral, particularly stand of mature Douglas-fir at chainage 1+20 • 10 sites of invasive vegetation within vicinity of lateral	• Temporary modification or permanent loss of mature, native vegetation (ponderosa pine, Douglas-fir, sagebrush, grasses) as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration	• Potential sites where footprint overlaps with mature vegetation, known invasive vegetation or plant species of concern (specific areas not able to be identified as construction footprint not known)	• Temporary modification or permanent loss of mature native vegetation (ponderosa pine, Douglas-fir, sagebrush, grasses) as a result of ROW clearing and widening • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities

Environmental Receptor	Preferred Option (PLR)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• Wildlife habitat features, including those identified during the PFR: • Three rock and talus outcrops (potential snake and bat habitat) (W001, W003, W004) • Lewis's Woodpecker nest (W002) • Earthen burrow (W005) • Wildlife tree (W006) • Swallow nesting colonies on cliffs adjacent to lateral (W007, W009) • Alder and willow thicket that may act as attractant to wildlife (W010) • Nest box (W011) • Areas where of known occurrence wildlife of concern are in the vicinity of the lateral, including: • Great Basin spadefoot occurrence at chainage 0+20 • Lewis's woodpecker nest (W002) • Nearby American badger den • Areas where the lateral overlaps federally-identified critical habitat polygons for Lewis' woodpecker and Great Basin gopher snake. Within these polygons, areas defined as critical habitat may be present as described below: • Lewis's woodpecker: Existing or suitable nesting trees and foraging habitat within the vicinity of these trees • Great Basin gopher snake: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, and open coniferous forest	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Alteration of critical habitat (Lewis's woodpecker, Great Basin gopher snake) within the construction footprint	High	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be adversely affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required: • Inventories should include a survey of the rock and talus outcrops identified during PFR. These habitat features should be examined to determine whether they represent bat or snake habitat • Conduct detailed follow-up assessments to determine if critical habitat features or attributes for Lewis's woodpecker or Great Basin gopher snake • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Areas where the lateral overlaps federally-identified critical habitat polygons for Lewis' woodpecker and Great Basin gopher snake (specific areas not able to be identified as construction footprint not known). Within these polygons, areas defined as critical habitat may be present as described below: • Lewis's woodpecker: Existing or suitable nesting trees and foraging habitat within the vicinity of these trees • Great Basin gopher snake: cliff, talus, rock outcrop, or earth covered rock outcrop, grassland or open shrub-steppe, and open coniferous forest	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration of critical habitat (Lewis's woodpecker, Great Basin gopher snake) within the construction footprint	High	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required: • Inventories should include a survey of the rock and talus outcrops identified during PFR. These habitat features should be examined to determine whether they represent bat or snake habitat • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.1.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.2** and **Table 5.3**.

Table 5.2 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral KA1 LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
KA1 LTL 168 (PLR)						
M1	BC Hydro Transformer Station (Meadow Road, Kamloops, BC)	BTEX/VPH, EPH, PAHs, PCBs, metals	70	Medium	50	TO-03

Notes: APEC - Area of Potential Environmental Concern; PCOCs – Potential Contaminants of Concern; BTEX - Benzene, Toluene, Ethylbenzene, Xylenes; EPH - Extractable Petroleum Hydrocarbons; PAHs - Polycyclic Aromatic Hydrocarbons; PCBs – Polychlorinated Biphenyls; VOCs – Volatile Organic Compounds; VPH - Volatile Petroleum Hydrocarbons

Table 5.3 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral KA1 LOP 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
KA1 LOP 168 (PLR)						
No APECs or Risk Areas Identified						

Notes: APEC - Area of Potential Environmental Concern; PCOCs – Potential Contaminants of Concern

If additional intrusive work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.1.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.4**.

Table 5.4 Regulatory Approvals and Timelines for KA1 LTL 168 and KA1 LOP 168

Permitting Agency	Permit/Approval/ Notification Name	Estimated Time to Be Issued once Submitted	Required for Preferred Option (PLR) (Y/N)	Required for Alternative Option (ILI)(Y/N)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	Yes - destruction of Lewis's Woodpecker critical habitat	Yes - destruction of Lewis's Woodpecker critical habitat
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	No
MFLNROD	General Wildlife Salvage Permit	1 month	Yes	Yes
	Scientific Fish Collection Permit	1 month	No	No
Regional District of North Okanagan	Development within ALR permit	~ 2 months	No	No
City of Kamloops	Riparian Areas Regulation Development Permit Area By-law No. 5-1-2273	~ 2 months	No	No
	Tree Cutting Permit		Yes	Yes
	Earthwork Permit		Yes	Yes
	Water Discharge Permit		Yes	Yes

5.2 SAL LOP 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated sites and groundwater are presented in **Sections 5.2.1** and **5.2.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.2.3.**

5.2.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors are provided in **Table 5.6**.

Table 5.5 Overview of Potential Effects and Risks to Biophysical Receptors Associated with SAL LOP 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones that overlap with ALR and • Construction zones that overlap with Shuswap National Golf Course • Construction zones that cross or are in the immediate vicinity of Highway 97A • Construction zones within the Enderby 2 Indian Reserve • Construction zones that overlap with municipal Environmentally Sensitive Areas	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Potential disruption to recreational activities during construction • Potential challenges to construction access and timing related to Highway use and access to Reserve land	Medium	• Public engagement • Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure and Enderby 2 Indian Reserve	• Areas where lateral overlaps with ALR (33.5 km) • Construction zones that overlap with Shuswap National Golf Course • Construction zones that cross or are in the immediate vicinity of Highway 97A • Construction zones within the Enderby 2 Indian Reserve • Construction zones that overlap with municipal Environmentally Sensitive Areas	• Temporary or permanent impact on soils and agricultural capacity of properties along entire lateral during construction • Potential disruption to recreational activities during construction • Potential challenges to construction access and timing related to Highway use and access to Reserve land	High	• Public engagement • Development and implementation of a soil management plan for work within the ALR • Site restoration activities Engagement with Ministry of Transportation and Infrastructure and Enderby 2 Indian Reserve
Surface Water Quality and Quantity	• 5 streams, wetlands, or NCDs that are crossed or have SPEAs crossed by lateral (TO_SAL LOP 168_008, 011, 029, 030, 035)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	• Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 27 Stream, wetland, or NCDs that are crossed or have SPEAs crossed by lateral (TO_SAL LOP 168_000, 001, 003, 004, 005, 006, 008 009, 010, 011, 013, 014, 015, 016, 019, 020, 023, 025, 027 028, 029, 030, 031, 032, 033, 034, 035)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Fish and Fish Habitat	• 4 known or potentially fish-bearing waterbodies cross the lateral or their SPEAs interacts with the lateral (TO_SAL LOP, 011, 029, 030, 035)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 24 known or potentially fish-bearing waterbodies cross the lateral or their SPEAs interacts with the lateral (TO_SAL LOP 168_001, 003, 004, 005, 006, 008 009, 010, 011, 013, 014, 015, 016, 019, 020, 023, 025, 027 028, 029, 030, 031, 032, 035)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• Construction areas within mature vegetation • Construction areas in the vicinity of invasive vegetation	• Temporary modification or permanent loss of mature native vegetation where construction activities overlap with forested areas (riparian corridors, between Enderby and Salmon Arm) • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities	• Areas of overlap with mature vegetation (riparian corridors, section of lateral between Enderby and Salmon Arm) ▫ 25 sites of invasive vegetation within study area	• Temporary modification or permanent loss of mature native vegetation where lateral is through forested areas (riparian corridors, between Enderby and Salmon Arm) • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Wildlife	• Wildlife habitat features located in the vicinity of proposed construction areas, including those identified during the PFR: • Barn swallow nesting colony (W001) • Potential great blue heron rookery (W002) • Amphibian breeding pond (W003) • Potential wildlife attractant areas (W010) • Active osprey nest (W007) • Game trails (W008) • Wildlife trees (W016) • Potential red-tailed hawk nest (W015) • Area where construction footprint overlaps with a core critical habitat polygon of Great Basin Spadefoot near Otter Lake (bend zone at chainage 2+634) • Areas defined as critical habitat may be present in this area, (i.e., grassland, shrub-steppe, and open forest habitat)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • The location of the potential great blue heron rookery identified during PFR would possibly be directly impacted by construction activities • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Alteration of critical habitat, within the construction footprint	High	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required: • Inventories should include a survey of the potential great blue heron rookery to determine if it is used for nesting • Conduct detailed follow-up assessments to determine if critical habitat features or attributes for Great Basin spadefoot are present or near known areas of disturbance • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located in the vicinity of the lateral, including those identified during the PFR: ▫ Barn swallow nesting colony (W001) ▫ Potential great blue heron rookery (W002) ▫ Amphibian breeding pond (W003) ▫ Potential wildlife attractant areas (W004, W010) ▫ Active osprey nests (W005, W007) ▫ Game trails (W008, W009) ▫ Wildlife trees (W008, W011, W013, W014, W016) ▫ Potential red-tailed hawk nests (W009, W015) • Areas of known occurrences of wildlife of concern, including: ▫ Great Basin spadefoot near chainage 2+90 ▫ Painted turtle observation in Gardhom Creek during PFR (W006) • Area where lateral overlaps core critical habitat polygon of Great Basin Spadefoot near Otter Lake • Areas defined as critical habitat are present in these areas, including sluggish streams, and seasonally wetted margins around permanent waterbodies and grassland, shrub-steppe and open forest.	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction ▫ The location of the potential great blue heron rookery identified during PFR would possibly be directly impacted by construction activities • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Alteration of critical habitat, within the construction footprint	High	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be adversely affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Inventories should include a survey of the potential great blue heron rookery to determine if it is used for nesting ▫ Conduct detailed follow-up assessments to determine if critical habitat features or attributes for Great Basin spadefoot are present or near known areas of disturbance • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.2.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the **Table 5.6**.

Table 5.6 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral SAL LOP 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
SAL LOP 168 (Inland Gas Upgrade Project)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional intrusive work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.2.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.7**.

Table 5.7 Regulatory Approvals and Timelines for SAL LOP 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI) (Y/N)	Required for Alternative Option (PLR) (Y/N)
DFO	Request for Project Review	2-3 months	Yes	Yes
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Yes
	Scientific Fish Collection Permit	2-4 weeks	Yes	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Yes	Yes

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI) (Y/N)	Required for Alternative Option (PLR) (Y/N)
MFLNROD	General Wildlife Salvage Permit	1 month	recommended	recommended
	Scientific Fish Collection Permit	1 month	Yes	Yes
City of Salmon Arm	Development Permit	Up to 2 months	Yes	Yes
	Tree Removal Permit		Yes	Yes
	Discharge Permit		Yes	Yes
Township of Spallumcheen	Development Permit	Up to 2 months	No	No

5.3 SA3 LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated sites and groundwater are presented in **Sections 5.3.1** and **5.3.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.3.3**.

5.3.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors are provided in **Table 5.8**.

Table 5.8 Overview of Potential Effects and Risks to Biophysical Receptors Associated with SA3 LTL 168

Environmental Receptor	Preferred Option (PLR)				Alternate Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Land Use	• Lateral overlap with the east side of Shuswap National Golf Course	• Disturbance to east side of golf course and potential disruption of recreational activities during construction	Medium	• Public engagement • Site restoration activities	• Valve zone and Crossover plant at the south end of lateral (overlap with ALR and adjacent to Shuswap National Golf Course)	• Disturbance of a small section of land in the golf course and potential disruption of recreational activities during construction	Low	• Public engagement • Site restoration activities
Surface Water Quality and Quantity	• Pond (TO_SA3 LTL 168_002)	• Impact to surface water (i.e., isolated golf course pond) unlikely considering its distance from the lateral (80 m)	Low	• Develop and implement an EMP and conduct environmental monitoring • Construction timing (i.e., avoid periods of heavy precipitation)	• None identified (no watercourses identified that overlap with construction areas)	• None anticipated	Nil	• None
Fish and Fish Habitat	• None identified (fish habitat unlikely present in study area (i.e., fish not anticipated to be present in pond)	• None anticipated	Low	• None	• None identified (fish habitat unlikely present in study area (i.e., fish not anticipated to be present in the golf course pond)	• None anticipated	Nil	• None
Vegetation	• Mature forest located along the west side of lateral • Patch of invasive vegetation overlapping with the crossover plant at south end of lateral	• Temporary modification (i.e., trimming of mature trees adjacent to lateral) or permanent loss of vegetation during RoW clearing • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment ▫ Only one site of invasive vegetation identified within the study area, potential for spread considered relatively low • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Site restoration activities	• Patch of invasive vegetation overlapping with the crossover plant	• Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment ▫ Only one site of invasive vegetation identified within the study area, potential for spread considered relatively low • Potential damage to or destruction of plant species of concern if present	Low	• Develop and implement an EMP and conduct environmental monitoring • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Site restoration activities

Environmental Receptor	Preferred Option (PLR)				Alternate Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Wildlife	• Pond (TO_SA3 LTL 168_002), a potential site for amphibian breeding • Wildlife habitat features, such as nests or borrows, potentially present along the lateral (none identified during PFR)	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required; • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• No specific features were identified during the PFR, but sensitive features potentially present include wildlife habitat features such as nests or burrows in the vicinity of the valve zone and crossover plant at the south end of the lateral	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be adversely affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required: • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.3.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.9**.

Table 5.9 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral SA3 LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length (m)	Figure
O1	Fortis pump station – Site Registry entry noting mercury contamination (6040 SE Auto Road, Salmon Arm)	Mercury	On-Site	High	50	TO-07
O2	Former Salmon Arm Municipal Landfill (5920 Auto Road south east, Salmon Arm)	BTEX/VPH, EPH, PAHs, VOCs, chlorinated and non-chlorinated phenols, metals	Adjacent	High	50	TO-07
O3	Shuswap National Golf Course Maintenance Shop (End of Lashburn Road, Salmon Arm)	BTEX/VPH, EPH, PAHs, metals	30 m east	Low	75	TO-07

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry

5.3.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of expected permits and approvals and estimated timeframe for issuance is provided in **Table 5.10**.

Table 5.10 Regulatory Approvals and Timelines for SA3 LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PLR) (Y/N)	Required for Alternate Option (ILI) (Y/N)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	No
MFLNROD	General Wildlife Salvage Permit	1 month	recommended	recommended
	Scientific Fish Collection Permit	1 month	No	No
City of Salmon Arm	Development Permit	Up to 2 months	Yes	Yes
	Tree Removal Permit		Yes	Yes
	Discharge Permit		Yes	Yes

5.4 COL LOP 168

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated sites and groundwater are presented in **Sections 5.4.1** and **5.4.3**. A list of permits and approvals that are expected to be required is also provided in **Section 5.4.3**.

5.4.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors are provided in **Table 5.11**.

Table 5.11 Overview of Potential Effects and Risks to Biophysical Receptors Associated with COL LOP 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Land Use	• The footprint of the PRS Site #6 is located on ALR land being used for cattle grazing • Street parking pullout on Row Park PRS Site #5	• Permanent loss of agricultural land within PRS Site #6 footprint • Permanent loss of lawn within the PRS Site # 5 footprint • Temporary disruption to street parking for Row Park during construction	Low	• N/A	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Alan Brooks Nature Centre ▫ Kalamalka Research Station ▫ Areas identified as low and medium conservation value by the City of Vernon ▫ Construction zones that cross or are in the immediate vicinity of Highway 97	• Potential disruption of recreational use in Alan Brooks Nature Centre during construction • Potential impacts to vegetation in Kalamalka Research Station during construction Potential challenges to construction access and timing related to Highway use	Medium	• Public engagement • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• 1 stream in the vicinity of PRS Site #5 (TO_COL LOP 168_000)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology and food and nutrient supply	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ 1 stream (TO_COL LOP 168_002) crosses the lateral	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Assess mapped watercourses (e.g., confirm presence, collect water quality, characterize habitat values and determine whether fish present) • Construction timing (i.e., avoid periods of heavy precipitation) • Waterbody isolation
Fish and Fish Habitat	• 1 known or potentially fish-bearing waterbody crosses the lateral or its SPEA interacts with the lateral PRS Site #5 (TO_COL LOP 168_000)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: • 1 known or potentially fish-bearing waterbody crosses the lateral or its SPEA interacts with the lateral (TO_COL LOP 168_002)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Vegetation	• Street trees on Bench Row Road near PRS Site #5	• Permanent loss of vegetation in the area covered by the footprint of PRS station(s) (grassland/pasture at PRS #5, manicured PRS #6) • Potential need for trimming/removal of street trees	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration activities	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Native grassland habitat, some of which is associated with Alan Brooks Nature Centre ▫ Street trees and trees associated with Kalamalka Research Station ▫ 8 sites of invasive vegetation within vicinity of lateral	• Temporary modification of native grassland/ shrubland habitat, some of which is associated with Alan Brooks Nature Centre • Potential need for trimming/removal of street trees and trees associated with Kalamalka Research Station • Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities
Wildlife	• Location of PRS stations that overlap critical habitat polygons of Great Basin spadefoot and western rattlesnake: • Although the PRS Site #6 was not visited during PFR, review of aerial imagery suggests this area is located within grassland, a biophysical feature considered critical habitat for both species • The conditions present at PRS Site #5 are not anticipated to include biophysical features or attributes for these species	• Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Permanent alteration of critical habitat at PRS Site #6	Medium	• Develop and implement an EMP and conduct environmental monitoring • Seek further information from the BC CDC regarding the occurrence of sensitive species that may be vulnerable to Project activities • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Conduct detailed follow-up assessments to confirm if critical habitat features or attributes for Great Basin spadefoot and western rattlesnake are present or near known areas of disturbance at PRS Site #6 • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Areas where of known occurrence wildlife of concern are in the vicinity of the lateral, including: ▪ Great Basin spadefoot south of Upperton Road near chainage 2+25 ▪ Several occurrences of gopher snakes on Middleton Mountain ▫ Areas where lateral overlaps with critical habitat polygons of Great Basin spadefoot, Great Basin gopher snake, and western rattlesnake ▪ Areas defined as critical habitat may be present in these areas (e.g., slow streams and riparian areas, grassland, shrub-steppe, rock outcrops): • CDC Sensitive Occurrence ID #7998	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Seek further information from the BC CDC regarding the occurrence of sensitive species that may be vulnerable to Project activities • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present) and that may be affected by Project activities. Surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Conduct detailed follow-up assessments to confirm if critical habitat features or attributes for Great Basin spadefoot, Great Basin gopher snake and western rattlesnake are present or near known areas of disturbance • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.4.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.9**.

Table 5.12 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral COL LOP 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
COL LOP 219 (Pressure Regulation)						
P3/Q1	Fortis Pump Station – Site Registry Entry noting Mercury Contamination (13190 Reservoir Road, Coldstream)	Mercury	On-Site	High	15	TO-35

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional intrusive work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.4.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of expected permits and approvals and the estimated timeframe for issuance is provided in **Table 5.13**.

Table 5.13 Regulatory Approvals and Timelines for COL LOP 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS) (Y/N)	Required for Alternative Option (ILI) (Y/N)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Possibly
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	Possibly
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Salvage	1 month	Recommended	Recommended

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS) (Y/N)	Required for Alternative Option (ILI) (Y/N)
	Permit			
	Scientific Fish Collection Permit	1 month	Possibly	Possibly
City of Vernon	Development Permit	Up to 2 months	Yes	Possibly
	Tree Cutting Permit		Yes	Possibly
	Soil Removal/Deposit Permit		Yes	Possibly
District of Coldstream	Watercourse Development Permit	Up to 2 months	No	Possibly
	Soil Removal / Soil Deposit Permit		Yes	Possibly
	Tree Cutting Permit		No	Possibly

5.5 COL LTL 219

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated sites and groundwater are presented in **Sections 5.5.1** and **5.5.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.5.3**.

5.5.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors are provided in **Table 5.14**.

Table 5.14 Overview of Potential Effects and Risks to Biophysical Receptors Associated with COL LTL 219

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Land Use	• ALR land being used for cattle grazing at footprint of PRS Site #6 • Street parking pullout for Row Park by PRS Site #5	• Permanent loss of agricultural land within PRS Site #6 footprint • Permanent loss of lawn within the PRS Site # 5 footprint • Temporary disruption to street parking for Row Park during construction	Low	• Site restoration activities	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Vernon Golf and Country Club ▫ Areas identified as low and medium conservation value by the City of Vernon ▫ Kalamalka Research Station	• Disturbance to west side of golf course and potential disruption of recreational activities during construction • Potential impacts to vegetation in Kalamalka Research Station during construction	Medium	• Public engagement • Site restoration activities
Surface Water Quality and Quantity	• 1 stream near PRS Site #5 (TO_COL LOP 168_000)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation) • Develop and implement an EMP that address factors including erosion and sediment control and spill prevention and response • Waterbody isolation	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ 4 streams cross the lateral (TO_COL LTL 219_000, 001, 002, 003)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Assess mapped watercourses (e.g., confirm presence, collect water quality) • Construction timing (i.e., avoid periods of heavy precipitation) • Develop and implement EMP that address factors including erosion and sediment control and spill prevention and response • Waterbody isolation
Fish and Fish Habitat	• 1 known or potentially fish-bearing waterbody crosses the lateral or its SPEA interacts with the lateral PRS Site #5 (TO_COL LOP 168_000)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence to inform construction planning activities and determine if salvage will be required • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ 4 known or potentially fish-bearing waterbodies cross the lateral or their SPEAs interact with the lateral (TO_COL LTL 219_000, 001, 002, 003)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Vegetation	• Street trees on Bench Row Road near PRS Site #5	• Permanent loss of vegetation in the area covered by the footprint of PRS station(s) (grassland/pasture at PRS #5, manicured PRS #6) • Potential need for trimming/removal of street trees	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration activities	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected ▫ Native grassland and shrubland habitat on the west side of the northern portion of lateral ▫ 1 site of invasive vegetation within the vicinity of the lateral ▫ Trees associated with Kalamalka Research Station	• Temporary modification of native grassland/ shrubland habitat on west side of northern portion of lateral • Temporary modification of vegetation associated with Vernon Golf and Country Club and Kalamalka Research Station • Potential damage to or destruction of plant species of concern if present • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities
Wildlife	• Location of PRS stations, which overlap critical habitat polygons of Great Basin spadefoot and western rattlesnake) • Although the site of PRS Site #6 was not visited during PFR, review of aerial imagery suggests that this area is located within grassland, a biophysical feature considered critical habitat for both species • The conditions present at PRS Site #5 are not anticipated to include biophysical features or attributes for these species,	• Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Permanent alteration of critical habitat	Medium	• Develop and implement an EMP and conduct environmental monitoring • Seek further information from the BC CDC regarding the occurrence of sensitive species that may be vulnerable to Project activities • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conduct detailed follow-up assessments to confirm if critical habitat features or attributes for Great Basin spadefoot and western rattlesnake are present or near known areas of disturbance at PRS Site #6 • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Areas where of known occurrence wildlife of concern are near the lateral, including several occurrences of gopher snakes on Middleton Mountain ▪ Areas where lateral overlaps with critical habitat polygons of Great Basin spadefoot, Great Basin gopher snake, and western rattlesnake ▪ Areas defined as critical habitat may be present in these areas (e.g., slow streams and riparian areas, grassland, shrub-steppe, rock outcrops):	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Seek further information from the BC CDC regarding the occurrence of sensitive species that may be vulnerable to Project activities • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required • Conduct detailed follow-up assessments to confirm if critical habitat features or attributes for Great Basin spadefoot, Great Basin gopher snake and western rattlesnake are present or near known areas of disturbance • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.5.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.15.**

Table 5.15 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral COL LTL 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
COL LTL 219 (Pressure Regulation)						
P1	Former Okanogan Turbo - Known off-site migration (1325 Polson Drive, Vernon)	BTEX/VPH, EPH, PAHs	Adjacent	Medium	50	TO-36
P3/Q1	Fortis Pump Station – Site Registry Entry noting Mercury Contamination (13190 Reservoir Road, Coldstream)	Mercury	On-Site	High	15	TO-35

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds

If additional intrusive work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.5.3 Environmental Permitting and Approvals

Based on the results of the EOA, several environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of expected permits and approvals and the estimated timeframe for issuance is provided in **Table 5.16**.

Table 5.16 Regulatory Approvals and Timelines for COL LTL 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS) (Y/N)	Required for Alternative Option (ILI) (Y/N)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Possibly
	Scientific Fish Collection Permit	2-4 weeks	Yes	Yes
ECCC	Section 73 Permit	3 months	No	Possibly
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Salvage Permit	1 month	recommended	recommended
	Scientific Fish Collection Permit	1 month	Yes	Yes
City of Vernon	Development Permit		Yes	Possibly
	Tree Cutting Permit		Yes	Possibly
	Soil Removal/Deposit Permit		Yes	Possibly
	Waste Discharge Permit		Yes	Possibly
District of Coldstream	Watercourse Development Permit	Up to 2 months	No	Possibly
	Soil Removal / Soil Deposit Permit		Yes	Possibly
	Tree Cutting Permit		No	Possibly

5.6 KE1 LOP 219

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated sites and groundwater are presented in **Sections 5.6.1** and **5.6.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.6.3**.

5.6.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors are provided in **Table 5.17**.

Table 5.17 Overview of Potential Effects and Risks to Biophysical Receptors Associated with KE1 LOP 219

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Land Use	• Walmart parking lot	• Temporary disruption of parking lot during site preparation and construction	Low	• Public engagement	• Mill Creek Linear Park and Enterprise Park • Wal-Mart parking lot	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Temporary disruption of recreational use, potential trail closure during construction ▫ Temporary disruption of parking lot during site preparation and construction ▫ Lateral crosses Natural Environment Development Permit Areas identified by the City of Kelowna	High	• Public engagement • Site restoration activities
Surface Water Quality and Quantity	• None	• No surface water is present within the anticipated construction area, therefore no adverse effects anticipated	Nil	• N/A	• TO_KE1_ KE1 LOP 219_001 (Mill Creek/ Kelowna Creek crosses the lateral 3 times	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Temporary diversion of surface water ▫ Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) ▫ Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Assess mapped watercourses (e.g., confirm presence, collect water quality) • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• None	• No fish habitat is present within the anticipated construction area, therefore no adverse effects anticipated	Nil	• N/A	• TO_KE1_ KE1 LOP 219_001 (Mill Creek/ Kelowna Creek crosses the lateral 3 times	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Temporary modification or permanent destruction of fish habitat ▫ Temporary disturbance to, or displacement of fish ▫ Direct injury or mortality to fish	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• None	• No vegetation is present within the anticipated construction area, therefore no adverse effects anticipated	Nil	• N/A	• Two rare plant communities mapped by the CDC as occurring along Mill Creek (if presence confirmed) (Black cottonwood - Douglas-fir / common snowberry - red-osier dogwood and Common Cattail Marsh) • One site of invasive vegetation within the vicinity of the lateral	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Temporary modification or permanent loss of vegetation during RoW clearing ▫ Impacts to two rare plant communities (if presence confirmed) ▫ Potential damage to or destruction of plant species of concern if present ▫ Spread of invasive vegetation as a result of increased areas of exposed soil during construction and movement of soil and seeds by equipment	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Confirm presence and location of identified ecological community of concern • Develop an invasive vegetation management plan to be implemented during construction • Site restoration activities

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Risk	Follow-up Activities / Mitigation
Wildlife	• None	• Potential noise disturbance to nearby wildlife as a result of construction activities, though it is anticipated that any wildlife present would likely be acclimatized to human activity	Low	• None	• Areas where lateral overlaps critical habitat polygon for Great Basin gopher snake • Areas that are defined as critical habitat may be present in the study area including talus, rock outcrop or earth covered rock outcrop, large rocks, and riparian habitat	Construction footprint for ILI was unknown at the time of assessment, so the overlap with sensitive areas could not be determined. However, the following environmental sensitivities may be adversely affected: ▫ Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction ▫ Temporary disturbance and displacement of wildlife as a result of construction activities ▫ Direct injury or mortality resulting from equipment operation ▫ Potential alteration of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Conduct surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, in order to inform construction planning activities and determine if salvage will be required; • Conduct detailed follow-up assessments to determine if critical habitat features or attributes for Great Basin gopherfoot are present or near known areas of disturbance • Where practical, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.6.2 Contaminated Sites and Groundwater

Risk Areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.18.**

Table 5.18 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for Lateral KE1 LOP 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral (m)	Risk Classification	Length of Risk Area (m)	Figure
KE1 LOP 219 (Pressure Regulation)						
R1	Various Auto Dealerships (2530 – 2590 Enterprise Way, Kelowna)	BTEX/VPH, EPH, PAHs, VOCs, glycols, metals	Adjacent	Medium	50	TO-38
R4	Fortis Pump Station – Site Registry Entry noting Mercury Contamination (1595 Spall Road, Kelowna)	Mercury	On-Site	High	60	TO-37

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VPH - Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds

If additional intrusive work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.6.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals are anticipated to be required prior to proceeding with Project construction. A list of expected permits and approvals and the estimated timeframe for issuance is provided in **Table 5.19**.

Table 5.19 Regulatory Approvals and Timelines for KEI LOP 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for preferred Option (PRS) (Y/N)	Required for Alternative Option (ILI) (Y/N)
DFO	Request for Project Review	2-3 months	No	Yes
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Possibly
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	Yes	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	45 days - 6+ months	Yes	Yes
MFLNROD	General Wildlife Salvage Permit	1 month	No	Yes
	Scientific Fish Collection Permit	1 month	No	Yes
City of Kelowna	Development Permit	Up to 2 months	No	Yes
	Tree Cutting Permit		No	Yes
	Approval for Construction activities in a Park		No	No
	Waste Water Discharge Permit		Possibly	Yes

6.0 GUIDING DOCUMENTS, BEST MANAGEMENT PRACTICES, AND MITIGATION MEASURES

Project activities have the potential to negatively impact environmental receptors associated with the laterals. Many of these impacts can be avoided or minimized through the implementation of standard best practices and mitigation measures developed to minimize potential adverse effects. Adhering to best practices also supports compliance with applicable legislation.

6.1 Guiding Documents and Best Management Practices

Guiding documents and Best Management Practices (BMPs) ensure that a project is planned and carried out in compliance with industry-specific methods or procedures. Guiding documents and BMPs that should be followed during Project activities, where practical, include the following:

6.1.1 Guiding Documents

- A Field Guide to Fuel Handling, Transportation and Storage (MWLAP 2002)
- A User's Guide to Working in and Around Water (MOE 2009*a*)
- BC OGC Environmental Protection and Management Guide Version 2.6 (OGC 2018)
- BC Water Quality Guidelines (MOE 2006)
- Fisheries Protection Policy Statement (DFO 2013*a*)
- FortisBC Generic Environmental Management Plan Low to Medium Risk Projects (Tera, 2015)
- FortisBC Generic Environmental Management Plan for Work in and About Water (Westland 2012)
- Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing ((MOE 2009*b*)
- Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013*b*)
- Oil and Gas Waste Regulation – Users Guide (DRAFT) (MOE 2007)
- Standards and Best Practices for Instream Works: Pipeline Crossings (MOE & DFO 2015)

6.1.2 Best Management Practices

- Best Management Practices for Amphibian and Reptile Salvages in British Columbia (Wind et al. 2013)
- Best Management Practices for Bats in British Columbia (MOE 2016)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014)
- Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia (MFLNRO 2014)
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE 2013)
- Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1993)
- Best Practices for Managing Invasive Plants on Oil and Gas Operations (PRRD and ISCBC 2013)

6.2 Mitigation Measures

Project-specific and site-specific mitigation measures are typically developed once the project design, timing, footprint and construction methods are known. They are developed to minimize/reduce an anticipated adverse effect.

6.2.1 Design Considerations

To the extent practicable, Project design should avoid impacts to sensitive habitats and species. Activities with locational flexibility (e.g., equipment storage, temporary workspaces) should be situated away from sensitive areas.

6.2.2 Project Timing

Project construction should be timed to avoid or minimize impacts to sensitive environmental receptors. There are least-risk timing windows to protect fish species, breeding birds and sensitive periods for other wildlife species.

6.2.2.1 Breeding Bird and Bat Least Risk Windows

Where possible, vegetation clearing and removal should be conducted outside of the breeding bird nesting period to avoid disturbance or destruction of active bird nests. The general nesting period for migratory birds may start as early as mid-March and extend until late August (ECCC 2017*d*). The following resources provide applicable breeding bird windows; however, nesting periods for each lateral should be determined by a qualified environmental professional (QEP):

- Region-specific nesting period calendars developed by the Government of Canada (ECCC 2017*d*)
- Okanagan Timing Windows for Nesting Birds (MOE 2017*b*)

If the breeding bird window cannot be avoided, pre-construction nest surveys should be undertaken by a QEP prior to any clearing of vegetation within suitable nesting habitat.

There are 17 species of bats reported to occur regularly in BC (Nagorsen et al. 2018). Eight species are provincially red- or blue- listed (CDC 2018). Two species are listed by SARA as endangered; little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis)*, and one species (spotted bat (*Euderma maculatum*)), is listed as special concern. Additional guidance (Forestry specific BMPs for bats) are currently being developed by as Chapter 7 in the provincial BMP series (MOE 2016). Specific considerations, including timing restrictions, are being afforded to tree-type nursery roosts. In accordance with the DRAFT guidance, Hemmera recommends that a QEP be consulted if removal of trees is anticipated, as this activity may affect tree roosting habitat for bats, including little brown myotis. Site specific scheduling may be required when non-volant bat pups may be present in tree roosts.

6.2.2.2 Fisheries Least Risk Timing Windows

Fisheries work windows have been developed to minimize impacts to fish within streams and waterbodies. Any construction within fish-bearing streams should take place during these windows. The following resources can be used to determine applicable fisheries timing windows:

- Okanagan, Similkameen & Upper Shuswap Fisheries Timing Windows (PDF) (MFLNROD 2018)
- Okanagan Fisheries and Species and General Timing Windows (MOE 2017*b*)

6.2.2.3 Amphibian and Turtle General Least Risk Periods

Amphibians and turtles are sensitive to work in and around aquatic features, particularly around ponds and wetlands. In areas where amphibians and turtles are expected, construction should be avoided during appropriate seasons depending on site use (*e.g.* hibernation, breeding and migration periods), as determined by a QEP.

6.2.3 Fish and Wildlife Salvage

Prior to any disturbance with aquatic habitats where fish or wildlife may be encountered, aquatic lifeform (i.e., amphibian and fish) salvages are recommended. Any salvage will require necessary permits under the *Wildlife Act* (and potentially *SARA*) and the *Fisheries Act* if salmonids are expected.

6.2.4 Site Restoration

Areas disturbed during construction should be restored to meet or improve upon pre-construction conditions, particularly for work within the ALR, in and around fish habitat, and near important wildlife habitat features. Project-specific restoration plans should be developed that outline how to stabilize any disturbed areas while maximising the resultant conditions and habitat values for environmental receptors.

6.2.5 Contaminated Soil and Groundwater Management

Within the APECs identified along the laterals, the potential to encounter contaminated soil and groundwater during construction poses a risk to the project. Where intrusive work is planned within medium- and high-risk APECs, additional soil and groundwater investigation is recommended to determine if contamination is present, quantify expected volumes of soil and groundwater that will require management, and refine the estimated liability. The investigation will allow for the development of a soil and water management plan to be used during Project planning (e.g. tendering) and will guide the management of these materials during construction. Within low-risk APECs, the potential for encountering contamination is low, and as such any contaminated soil and/or groundwater encountered is recommended to be managed during construction activities.

6.2.6 Environmental Management Plan and Environmental Monitoring

All construction should be undertaken in accordance with FortisBC's Generic Environmental Management Plans (Tera 2015). Additionally, project-specific Construction Environmental Management Plan(s) (CEMP) should be developed by a QEP, where appropriate. CEMPs should address factors such as erosion and sediment control, spill prevention and response, and provide other applicable site-specific measures to avoid or mitigate potential negative impacts to environmental resources.

Environmental construction monitoring should also be utilized to ensure the proper implementation of these mitigation measures and to confirm that any potential negative effects to the environment are avoided or minimized.

7.0 CLOSURE

The content of this report is based on information obtained during desktop studies and PFR activities. The findings presented herein should be considered within the context of the scope of work and Project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

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8.0 REFERENCES

BCUC. 2015. 2015 Certificate of Public Convenience and Necessity Application Guidelines.

BirdLife International, Bird Studies Canada, and Nature Canada. 2018. Important Bird Areas in Canada: Site catalogue. Online Database. <http://www.ibacanada.ca/explore.jsp?lang=EN>.

BC CDC. 2017. BC Species and Ecosystems Explorer. BC Conservation Data Centre (CDC); BC Ministry of Environment, Victoria, BC. <http://a100.gov.bc.ca/pub/eswp/>. Accessed 20 Sep 2017.

Chilibeck, B., G. Chislett, and G. Norris. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/Library/165353.pdf>.

City of Armstrong. 2014. City of Armstong Official Community Plan, Bylaw 1750, 2014; Map 9.4 - Development Permit Areas. <https://armstrong.civicweb.net/document/63923/1750%20-%20Official%20Community%20Plan%20As%20Adopted.pdf?handle=F6B1F66AC44247DCB03E77761678B214>.

City of Kamloops. 2017. City of Kamloops Official Community Plan. <https://www.kamloops.ca/homes-business/community-planning-zoning/official-community-plan-kamplan>.

City of Kamloops. 2018. City of Kamloops: Parks and Recreation - Dufferin Park. <https://www.kamloops.ca/parks-recreation/parks/dufferin-park>.

City of Kelowna. 2018. iKelowna Map Viewer. <https://maps.kelowna.ca/public/mapviewer/>.

City of Salmon Arm. 2011. City of Salmon Arm Official Community Plan - Map 5.2: Environmentally Sensitive Riparian Areas. <https://www.salmonarm.ca/DocumentCenter/View/43>.

City of Vernon. 2018. City of Vernon Environmental Management Areas Strategy. <https://www.vernon.ca/sites/default/files/docs/bylaws/OCP/environmental_mgmt_strategy.pdf>.

DataBC. 2017. New iMapBC 2.0. Government of British Columbia - DataBC. Online Database. <http://www.data.gov.bc.ca/dbc/geographic/view_and_analyze/imapbc/index.page>. Accessed 7 Mar 2017.

DataBC. 2018. DataBC. Government of British Columbia - DataBC. Online Database created by the BC Ministry of Forests, Lands and Natural Resource Operations. <https://data.gov.bc.ca/>.

DFO. 2013*a*. Fisheries Protection Policy Statement. Fisheries and Oceans Canada, Ottawa, ON. <http://www.dfo-mpo.gc.ca/pnw-ppe/pol/PolicyStatement-EnoncePolitique-eng.pdf>.

DFO. 2013*b*. Measures to Avoid Causing Harm to Fish and Fish Habitat. Fisheries and Oceans Canada (DFO). <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>.

DFO. 2014. Science Advice for Managing Risk and Uncertainty in Operational Decisions of the Fisheries Protection Program. Science Advisory Report 2014/015, Department of Fisheries and Oceans Canada.

ECCC. 2017*a*. Recovery strategy for the Lewis's Woodpecker (*Melanerpes lewis*) in Canada [final]. *Species at Risk Act* recovery strategy series. Environment and Climate Change Canada (ECCC), Ottawa. <https://sararegistry.gc.ca/default.asp?lang=En&n=F2F16DFD-1&offset=1&toc=show>. Accessed 13 Apr 2017.

ECCC. 2017*b*. Recovery strategy for the great basin spadefoot (*Spea intermontana*) in Canada [proposed]. *Species at Risk Act* recovery strategy series. Environment and Climate Change Canada (ECCC), Ottawa. <https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_great_basin_spadefoot_e_proposed.pdf>. Accessed 13 Apr 2017.

ECCC. 2017*c*. Recovery Strategy for the Western Rattlesnake (*Crotalus oreganus*)Great Basin Gophersnake (<i>Pituophis catenifer deserticola<i>) and the Desert Nightsnake (<i>Hypsiglena chlorophaea<i>) in Canada 2017 *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada (ECCC), Ottawa. <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=B6D9C7DE-1&offset=1&toc=show>. Accessed 13 Apr 2017.

ECCC. 2017*d*. General Nesting Periods of Migratory Birds in Canada. Environment and Climate Change Canada (ECCC) - General Nesting Periods of Migratory Birds in Canada. Government of Canada. <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1>. Accessed 12 Oct 2017.

Government of Canada. 2002. Species at Risk Act. S.C. 2002, c. 29. <http://laws-lois.justice.gc.ca/eng/acts/s-15.3/>.

Government of Canada. 2018. Species at Risk Public Registry - General Questions and Answers on SARA Permits. <https://www.sararegistry.gc.ca/default.asp?lang=En&n=EA35A22E-1>. Accessed 24 May 2018.

Hope, G. D., D. A. Lloyd, W. R. Mitchell, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Chapter 9: Ponderosa Pine Zone. Pages 139–151 *in*. Ecosystems of British Columbia. Special report series / British Columbia. Ministry of Forests; no. 6 ISSN 0843-6452, Ministry of Forests (MoF), Victoria, BC.

Hope, G. D., W. R. Mitchell, D. A. Lloyd, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Chapter 10: Interior Douglas-fir Zone. Pages 167–181 *in*. Ecosystems of British Columbia. Special Report Series 6, Ministry of Forests, Victoria, BC.

Kamloopstrails.net. 2018. Kamloops HIking Trails: Kenna Cartwright Park. <http://www.kamloopshikingtrails.com/city-parks/kenna-cartwright-park>.

MFLNRO. 2014. Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia. BC Ministry of Forests, Lands and Natural Resource Operations, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf>. Accessed 30 Jun 2014.

MOE & DFO. 2015. Standards and Best Practices for Instream Works: Pipelin Crossings - Version 1.0. <http://www.env.gov.bc.ca/wld/instreamworks/downloads/PipelineCrossings.pdf>.

BC MOE. 2014. Develop with Care 2014: Environmental guidelines for urban and rural land development in British Columbia. B.C. Ministry of Environment, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/>. Accessed 14 Oct 2014.

MOE. 1983. Land capability classification for agriculture in British Columbia. MOE Manual 1, Prepared by B.C. Ministry of Environment, Surveys and Resource Mapping Branch, and B.C. Ministry of Agriculture and Food, Soils Branch, Kelowna, B.C. <http://www.env.gov.bc.ca/wld/documents/techpub/moe1/moem1.pdf>.

MOE. 2006. British Columbia Approved Water Quality Guidelines 2006 Edition. British Columbia Ministry of Environment (MOE), Victoria, B.C. <http://www2.gov.bc.ca/gov/topic.page?id=044DD64C7E24415D83D07430964113C9>.

MOE. 2007. Oil and Gas Waste Regulation - User's Guide (Draft).

MOE. 2009*a*. A User's Guide to Working In and Around Water - Understanding the Regulation Under British Columbia's Water Act - updated. B.C. Ministry of Environment, Water Stewardship Division. <http://env.gov.bc.ca/wsd/water_rights/cabinet/working_around_water.pdf>.

MOE. 2009*b*. Technical Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing. BC Ministry of Environment. <http://www.env.gov.bc.ca/epd/remediation/guidance/index.htm>.

MOE. 2013. Guidelines for Raptor Conservation During Urban and Rural Land Development in British Columbia. Best Management Practices, B.C. Ministry of Environment. <http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf>. Accessed 15 Aug 2013.

MOE. 2016. Best Management Practices for Bats in British Columbia. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12460>. Accessed 7 Jun 2016.

MOE. 2017*a*. Fisheries Inventory - Fisheries Information Summary System (FISS). Provincial Database created by B.C. Ministry of Environment. <http://www.env.gov.bc.ca/fish/fiss/index.html>.

MOE. 2017*b*. Okanagan Region Timing Windows. <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/working-around-water/regional-terms-conditions-timing-windows/okanagan-region-timing-windows>.

BC MOFR, and BC MELP. 2010. Field Manual for Describing Terrestrial Ecosystems - 2nd edition. British Columbia Ministry of Forests and Range & British Columbia Ministry of Environment Lands and Parks. Land Management Handbook, Forest Science Program, Victoria, BC. <https://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh25-2.htm>.

MWLAP. 2002. A Field Guide to Fuel Handling, Transportation and Storage. 3rd Edition, BC Ministry of Water, Land and Air Protection and BC Ministry of Forests. <http://www.env.gov.bc.ca/epd/industrial/oil_gas/pdf/fuel_handle_guide.pdf>.

MWLAP. 2004. Identified Wildlife Management Strategy: Procedures for Managing Identified Wildife (Version 2004). BC Ministry of Water, Land and Air Protection.

Nagorsen, D., M. Brigham,, C. Lausen, and J. Hobbs. 2018. Bats of Britsh Columbia (in Prep). Royal British Columbia Museum.

Nicholson, A., E. Hamilton, W. L. Harper, and B. M. Wikeem. 1991. Chapter 8: Bunchgrass Zone. Pages 125–137 *in*. Ecosystems of British Columbia. Special report series / British Columbia. Ministry of Forests; no. 6 ISSN 0843-6452, Ministry of Forests (MoF), Victoria, BC.

OGC. 2018. Environmental Protection and Management Guide Version 2.6. <https://www.bcogc.ca/node/5899/download>. Accessed 6 Mar 2018.

PRRD and ISCBC. 2013. Best Practices for Managing Invasive Plants on Oil & Gas Operations: A Pocket Guide for British Columbia's Oil and Gas Workers. Invasive Species Council of British Columbia and Peace River Regional District Invasive Plant Committee. <https://bcinvasives.ca/documents/OG-Guide_2013_FINAL.v2.pdf>.

Stipec, K. pers.comm. 2018. Correspondence Regarding Masked CDC Occurrences for Fortis In-land Upgrade Project.

Township of Spallumcheen. 2011. Township of Spallumcheen Offical Community Plan Bylaw No. 1794, 2011: Schedule C. <https://spallumcheen.civicweb.net/filepro/documents/9>.

Wind, E. M., M. Sarell, N. Sands, and S. Sloboda. 2013. Best Management Practices for Amphibian and Reptile Salvages in British Columbia. Working Draft., Ministry of Forests, Lands, and Natural Resource Operations, Surrey, B.C.

WiTS. 2018. Wildlife Tree Stewardship Atlas. WiTS Wildlife Tree Stewardship. a BC Nature program. <http://www.wildlifetree.ca/about.html>.

APPENDIX A
Environmental Worksheets

APPENDIX B
Photographic Log

APPENDIX C

Species of Concern Potential for Occurrence Table

APPENDIX D
Waterbody Summary Table

Inland Gas Upgrades Project
Environmental Overview Assessment
Kootenays Sub-Region

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EXECUTIVE SUMMARY

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and include the replacement of 4 laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations (PRS) to manage the remaining 14 laterals. The existing 29 laterals are in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3). This Environmental Overview Assessment (EOA) report presents Project environmental risks associated with Set 3, the Kootenays sub-region.

The general study area for this EOA includes the length of the referenced laterals, with a 100 m width on either side of the lateral. A 500-m wide study area was used to assess potential wildlife and species at risk presence during desktop review.

A desktop assessment was completed for each lateral proposed for upgrading. The information gathered in the desktop assessment was used to identify environmental receptors of concern and to focus and refine the scope of preliminary field reconnaissance (PFR) activities undertaken to ground-truth information gathered at the desktop level. Information included in the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Data collection and PFR methods specific to each environmental receptor category are described within this report.

PFR work was undertaken by biologists from Nupqu Development Corporation in May and June of 2018. The PFR supported the desktop assessments and gathered biophysical information for the study areas associated with laterals where ILI or pipeline replacement are the preferred engineering options. For laterals where PRS was the preferred option, field data was collected at the location of the proposed PRS station. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 3 laterals in the event additional ILI or replacement activities are required or should additional footprint be required (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active agricultural areas) were not visited during PFR, unless a reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

This report provides a high-level overview of the potential adverse effects to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities (i.e., where the anticipated construction footprint overlaps with identified features), and where factors present a risk to the Project. For the purposes of this report, risks to the Project include additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals). The following table is a summary of the Project risks identified for the Kootenays sub-region.

Lateral (Upgrade Options)	Project Risk(s)											
	Preferred Option						Alternative Option					
	Environmental Receptors											
	Land Use	Surface Water Quality and Quantity	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites	Land Use	Surface Water Quality and Quantity	Fish and Fish Habitat	Vegetation	Wildlife	Contaminated Sites
CEL LTL 168 (PRS/ILI)	Nil	Nil	Nil	Nil	Low	No risk areas identified	Med	Low	Low	Med	Med	No risk areas identified
CAS NEL 168 (PRS/ILI)	Low	Nil	Nil	Nil	Low	No risk areas identified	High	High	High	Med	High	3 low risk, 3 medium risk and 1 high risk APEC
TRA LTL 168 (PRS/ILI)	Nil	Nil	Nil	Nil	Low	1 medium and 1 high risk APEC	Low	Med	Med	Med	High	I low risk, I medium risk and 7 high risk APEC's
KBY LTL 168 (ILI/PLR)	Med	Low	Low	Med	Med	2 high risk APEC's	Med	High	High	Med	High	1 medium risk and 3 high risk APEC's
CRK LP2 219 (ILI/PLR)	Med	Low	Low	Med	Med	1 medium risk APEC	Med	Med	Med	Med	Med	1 medium risk and 1 low risk APEC
CRK LOP 273 (ILI/PLR)	Med	Med	Med	Med	Med	No risk areas identified	High	High	High	Med	Med	1 medium risk APEC
CRK LTL 168 (ILI/PLR)	Low	Med	High	High	Med	No risk areas identified	Low	High	High	High	High	No risk areas identified
CRK LOP 219 (ILI/PLR)	Low	Med	High	High	Med	No risk areas identified	Low	High	High	High	High	No risk areas identified

Lateral (Upgrade Options)	Project Risk(s)											
	Preferred Option						**Alternative Option**					
	Environmental Receptors											
	Land Use	**Surface Water Quality and Quantity**	**Fish and Fish Habitat**	**Vegetation**	**Wildlife**	**Contaminated Sites**	**Land Use**	**Surface Water Quality and Quantity**	**Fish and Fish Habitat**	**Vegetation**	**Wildlife**	**Contaminated Sites**
SSK LTL 219 (ILI/PLR)	Med	Low	Nil	High	High	1 medium risk APEC	High	High	High	High	High	2 medium risk APEC's
FRD LTL 219 and 168 (ILI/PLR)	High	High	High	High	Med	3 medium and 1 high risk APEC	High	High	High	High	High	2 low risk, 7 medium risk and 3 high risk APEC's
ELK LTL 168 (PRS/PLR)	Low	Nil	Nil	Low	Low	No risk areas identified	Low	Low	Low	Low	Low	2 medium risk APEC's

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APPENDICES

Appendix A	Environmental Worksheets
Appendix B	Photographic Log
Appendix C	Species of Concern Potential for Occurrence Table
Appendix D	Waterbody Summary Table

This work was performed in accordance with Blanket Order Number: 4500052346 between Hemmera Envirochem Inc. (Hemmera) and FortisBC Energy Inc. (Client), dated March 13, 2018 (Contract) as well as the Inland Gas Upgrade Project – Change Order to Address Revisions to Upgrade Priorities, dated October 3, 2018. This report has been prepared by Hemmera, based on fieldwork conducted by Hemmera, for sole benefit and use by insert client name. In performing this work, Hemmera has relied in good faith on information provided by others and has assumed that the information provided by those individuals is both complete and accurate. This work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations

1.0 INTRODUCTION

FortisBC Energy Inc. (FortisBC) is proposing to update 29 of its transmission pressure lateral gas pipelines to support the integrity and longevity of the system. The combined works are referred to as the Inland Gas Upgrades Project (the Project) and includes the replacement of four laterals, updates to 11 laterals to accommodate in line inspection (ILI), and the installation of pressure regulating stations (PRS) to manage the remaining 14 laterals. The existing 29 laterals are in three sub-regions of BC and have been grouped into sets: Northern and Central BC (Set 1), Thompson-Okanagan (Set 2), and the Kootenays (Set 3).

Hemmera Envirochem Inc. (Hemmera) was retained by FortisBC to prepare high level Environmental Overview Assessment (EOA) reports for the Project. This EOA report presents a description of the existing environment and the environmental risks associated with Set 3, the Kootenays sub-region.

To proceed, FortisBC requires a Certificate of Public Convenience and Necessity (CPCN) from the British Columbia Utilities Commission (BCUC) as per section 45(1) and 46(1) of the *Utilities Commission Act*. This Environmental Overview Assessment (EOA) report will be used by FortisBC in support of the CPCN application.

The content of the EOA reports are intended to meet the CPCN application guidelines (BCUC 2015). As such, this report identifies environmental receptors in or adjacent to the expected footprint of the Project, potential impacts to those receptors, and environmental risks to be addressed or mitigated prior to and/or during construction (and in some cases post-construction). Most of these risks carry Project cost and schedule implications. This report provides an overview of five main environmental receptor categories:

1. Land use
2. Contaminated sites (water and soil)
3. Fish and fish habitat
4. Vegetation (including invasive plants)
5. Wildlife.

Species at risk are addressed within the fish, vegetation and wildlife assessments.

1.1 Project Scope and Area

FortisBC identified preferred and alternative engineering options for each lateral in the Kootenay sub-region. The Set 3 laterals and the associated preferred and alternative engineering options are listed in **Table 1.1**. The location of each lateral and anticipated construction footprints are shown in the Environmental Worksheets (Appendix A). The engineering options are described as follows:

- Pipeline replacement (PLR): The construction footprint is expected to be 30 m wide for the length of the pipeline. Pipeline replacement activities include:
  - Installation of a new pipeline in parallel with the existing pipeline
  - Deactivation and abandonment in place of the old line
- In-line inspection (ILI): The estimated construction footprint for each area of disturbance is expected to range from 50 square meters (m^2) to 500 m^2 depending on the associated activity. ILI upgrade activities include:
  - Installation of pig barrels at each end of the pipeline to allow ILI tools to be launched and received
  - Installation of control valve assembly stations
  - Replacement of non-ILI compatible sections and features such as bends, valves, tees, and stopple fittings
- Pressure regulating station (PRS). The construction footprint will be between 1000 m^2 and 2000 m^2, and includes:
  - Installation of a pressure regulating station at the start of the lateral.

Table 1.1 Kootenays ILI Lateral/Loop Summary

Full Name	Abbreviation	Length (km)	Preferred Option	Alternative Option
CELGAR LATERAL 168	CEL LTL 168	5.8	PRS	ILI
CASTLEGAR NELSON 168	CAS NEL 168	37.4	PRS	ILI
TRAIL LATERAL 168	TRA LTL 168	4.2	PRS	ILI
KIMBERLY LATERAL 168	KBY LTL 168	20.6	ILI	PLR
CRANBROOK KIMBERLEY LOOP 219	CRK LP2 219	4.0	ILI	PLR
CRANBROOK KIMBERLEY LOOP 273	CRK LOP 273	9.4	ILI	PLR
CRANBROOK LATERAL 168	CRK LTL 168	34.0	ILI	PLR
CRANBROOK LOOP 219	CRK LOP 219	34.0	ILI	PLR
SKOOKUMCHUCK LATERAL 219	SSK LTL 219	35.9	ILI	PLR
FORDING LATERAL 168	FRD LTL 168	45.1	ILI	PLR
FORDING LATERAL 219	FRD LTL 219	34.5	ILI	PLR
ELKVIEW LATERAL 168	ELK LTL 168	1.6	PRS	PLR

Note: ILI = In-line Investigations; PLR = Pipeline Replacement; PRS = Pressure Regulating Stations

Anticipated construction activities associated with the Project construction phase are outlined below:

- Site preparation:
  - Mobilization and demobilization of construction equipment and materials
  - Storage of construction equipment and materials
  - Development of temporary and permanent workspaces
  - Right of Way (ROW) clearing and widening (vegetation clearing and grubbing)
- Trench, pit, or site excavation:
  - Removal of asphalt
  - Stripping of topsoil
  - Site grading
  - Trench excavation
  - Stream crossings including trenchless (e.g., horizontal directional drilling (HDD)) or open-cut crossing methods
- Material stockpiling and disposal:
  - Stockpiling of excavated materials
  - Disposal of contaminated soil
- Pipe/features installation/ PRS construction and hydrostatic testing:
  - Installation of pipeline features
  - Construction of PRS
  - Potential concrete pouring
  - Backfilling and covering the trench
  - Capping and filling of installed sections of pipeline with hydrostatic test water
    - Water may be drawn from municipal sources or potentially from nearby natural water features
    - Disposal/discharge of hydrostatic test water
- Water quality and quantity management
  - Pumping and discharge of groundwater encountered during excavation (or from surface water sources)
  - Treatment of contaminated or sediment-laden water prior to discharge to aquatic habitat
- Landscape restoration
  - Grading and smoothing of the ground surface
  - Placement of topsoil
  - Hydroseeding or replanting of groundcover
  - Potential stream channel and riparian habitat restoration
- Maintenance and operations
  - Vegetation management
  - Invasive vegetation removal.

2.0 METHODS

The general study area for this EOA includes the length of the referenced laterals as outlined in **Table 1.1**, with a 100 m width on either side of the lateral. This 100 m study area facilitates gathering sufficient information to meet OGC requirements, which will be important for the future permitting phase of the Project. A 500-m study area was used to gather records of known wildlife and species at risk use and to assess their potential presence during desktop review.

A desktop assessment was completed for each lateral (**Section 3.0**). Information gathered during the desktop assessment was based on queries of government databases, available in-house data, and open source spatial data. Information sources used in the desktop assessment are listed in **Table 2.1**. The information gathered in the desktop assessment was used to identify potential risks associated with each of the environmental receptors and to focus and refine the scope of Preliminary Field Reconnaissance (PFR) undertaken to ground-truth the information gathered during the desktop assessment. Data collection and PFR methods specific to each environmental receptor category are described in the sub-sections below.

Table 2.1 Desktop Information Sources

Data Source	Information Reviewed	Data Access Date
Federal		
Species at Risk Public Registry (SARA)	Review of federally listed species at risk with identified critical habitat not included in the critical habitat spatial data available from DataBC (i.e., species with recovery strategies posted after August 2017)	April 2018
Environment and Climate Change Canada (ECCC)	Critical habitat for whitebark pine (spatial data not yet available through BC Data Catalogue)	April 2018
Committee of the Status of Endangered Wildlife in Canada (COSEWIC)	Assessment Reports (range and habitat requirements) of species of concern identified with potential to occur within study area	March – April 2018
Federal Contaminated Sites Registry	All known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment	April – June 2018
Provincial		
BC Conservation Data Centre (BC CDC)	Data provided for masked (i.e., confidential) species at risk occurrences within the study area	
BC Data Catalogue	Agricultural capability mapping Agricultural Land Reserve (ALR) boundary Biogeoclimatic Ecosystem Classification (BEC) map CDC element occurrences – (masked/sensitive and public occurrences) Community Watersheds – current Critical habitat for federally-listed species at risk (posted) Freshwater Atlas (man-made waterbodies, rivers, stream network and lines, wetlands); Invasive Alien Plant Site (i.e., known locations of noxious weeds)	February – April 2018

Data Source	Information Reviewed	Data Access Date
	Known BC fish observations Municipal Boundaries Old Growth Management Areas Parcel Map BC Parcel Fabric (to determine lot boundaries and land ownership) Parks and Protected Areas Roads Ungulate Winter Range (approved) Vegetation Resource Inventory (VRI) - forest vegetation composite polygons and Rank 1 layer (review of age class to determine presence of old growth forest) Wildlife Habitat Areas (approved)	
BC Weed Control Regulation	Review of Provincially and Regionally Designated Noxious Weeds	March 2018
BC Site Registry	The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*.	April – June 2018
Regional/Municipal		
Cities of Castlegar, Nelson, Cranbrook, Kimberly and Trail; Regional District Municipalities of Elkford and Sparwood	Online map applications where available Review of potentially applicable municipal by-laws	March 2018
Regional Districts of Central Kootenay, Kootenay Boundary and East Kootenay	Review of potentially applicable municipal by-laws	March 2018
Other		
Hemmera's Species at Risk Technical Expert	Personal database (compilation of occurrence and observation records) of Species at Risk occurrences within BC	April 2018
FortisBC	Lateral alignment	March 23, 2108
	Lateral details (including locations of bends, valves, tees, stopples, etc.).	April 30, 2018
Bing, ESRI, Google	Ortho-imagery	February – April 2018
eFlora and eFauna	Atlas pages (range and habitat requirements) of species at risk identified to have potential to occur within study area	April – June 2018
Stantec (via FortisBC)	Construction details of Pressure Regulation Sites	May 14, 2018
Wildlife Tree Stewardship Atlas	Review of the Bald Eagle and Osprey nest registry	April 2018
BirdLife International	Important Bird Area Maps	April 2018
Nature Trust British Columbia Properties Web App	Properties owned by the Nature Trust of British Columbia	March 2018
Ecolog ERIS Report	Search of 49 environmental databases	April – June 2018
UBC Geographic Information Centre	Historical aerial photographs	April – June 2018

PFR work was undertaken by biologists from Nupqu Development Corporation in May and June of 2018. The PFR supported the desktop assessments and gathered additional biophysical information for the study areas associated with each lateral. For laterals where PRS is the preferred engineering option, the PFR activities were limited to the proposed location of the PRS site. Greenfield areas (i.e., generally undisturbed, natural, vegetated areas) were assessed to confirm desktop data and to capture environmental risks (e.g., unmapped waterbodies, species at risk presence or evidence of potential soil contamination) that were not apparent during the desktop assessment. The assessments included broad coverage of the Set 3 laterals in the event additional ILI or replacement activities are required or should additional footprint be needed (e.g., access road(s) or expanded/new work space). Brownfield sites (i.e., disturbed sites that are already paved, developed and are active ALR areas) were not visited during PFR, unless a compelling reason to visit the site was identified during the desktop assessment (e.g., an identified construction zone or an area of potential environmental concern (APEC)).

The dates and areas assessed during PFR for each lateral are outlined below:

- CEL LTL 168: May 31, 2018 – Existing lateral was accessed by vehicle, UTV or by foot[1]
- CAS NEL 168: May 29 – 31, 2018 – Access to this lateral was very challenging; where possible it was assessed on foot
- TRA LTL 168: May 28, 2018 – Lateral was assessed primary on foot due to limited access
- KBY LTL 168: June 6, 2018 – Existing alignment was assessed by UTV
- CRK LOP 219 and CRK LOP2 219: June 5-7, 2018 – Existing alignment was assessed by foot, truck, or UTV depending on access
- CRK LTL 168 and CRK LOP 273: June 5-7, 2018 – Existing alignment was assessed by foot, truck, or UTV depending on access
- SSK LTL 219: June 5-6, 2018 – Existing alignment was assessed by UTV
- FRD LTL 219 and 168: May 21 – 26, 2018 – Existing alignment was assessed on foot or by UTV where terrain permitted
- ELK LTL 168: May 23, 2018 – Existing alignment was assessed mainly by UTV[1].

Representative photos were taken at environmental points of interest (e.g., watercourses, wildlife features, vegetation features) and at regular reference points (i.e., approximately every 200 m where access permitted). Select photos of key features are provided in a photo log (**Appendix B**). Additional reference photos are available upon request.

2.1 Land Use

Land use values from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- General ownership of land within the study area (e.g., federal, provincial crown, municipal, private)
- Regional districts and municipalities overlapped by the study area
- Parks and protected areas within the study area
- ALR areas overlapped by the study area and the number of properties within the ALR intersected by the lateral

[1] At the time of field studies the entire alignment was assessed

- Agricultural land capability classification of soils within the ALR (classes range from 1 to 7, with Class 1 land being capable of producing a wide range of crops on deep, well-drained, level soils, to Class 7 land with no capability for agriculture, such as bedrock and non-soil areas (MOE 1983)

During PFR, any areas where land use was observed to be different from the aerial imagery used for mapping and desktop analysis was recorded and geographically referenced.

2.2 Contaminated Sites (Water and Soil)

A desktop assessment was completed for each of the laterals to identify APECs where contaminated soil and groundwater may be encountered during the proposed construction activities. To identify APECs, Ecolog ERIS reports and current and historical aerial photographs were reviewed to identify potentially contaminated sites. Subsequently, site visits were completed as part of PFR activities, focusing on suspect sites where past/present land use and operations were indeterminable through review of historical photographs and record searches.

The Ecolog ERIS reports included a search of 49 environmental databases for record entries within 250 m of the laterals, of which the most relevant are the following:

- Authorization Management System (formerly WASTE)
- BC Ministry of the Environment and Climate Change Strategy (MOE) Online Site Registry
- Chemical Register
- Environmental Issues Inventory System
- Federal Contaminated Sites Inventory (FCSI)
- National Environmental Emergencies System
- National PCB Inventory (federal) and Inventory of PCB Storage Sites (provincial)
- National Pollutant Release Inventory (NPRI)
- Oil and Gas Wells
- Retail Fuel Storage Tanks
- Scott's Manufacturing Directory
- Special Waste Information System
- Waste Disposal Site Inventory
- Waste Generators Summary
- Waste Receivers Summary
- Wastewater Discharge Inventory

The primary databases relied on to identify known and potentially contaminated sites were the BC MOE Online Site Registry and the FCSI. The BC MOE Online Site Registry is a database of sites that have submitted information to the BC MOE with respect to the *BC Environmental Management Act*. Where Site Registry results were identified within 50 m of the laterals, Detailed Registry Reports were requested to gather additional information. The FCSI includes information on all known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations, as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility.

Historical aerial photographs sourced from Natural Resources Canada's National Air Photo Library, were requested through Ecolog ERIS and reviewed to identify operations that were potential APECs. Where significant gaps were present in the years of available aerial photos, or the quality of available aerial photos was poor, supplemental aerials were requested from the University of British Columbia Geographic Information Centre. Each of the laterals were also reviewed using current and historical aerial and street view photography available in Google Earth.

Where site visits were completed, the laterals and adjacent properties were assessed for potentially contaminating operations (e.g., auto repair, manufacturing, gas stations, industrial operations, etc.), evidence of underground or aboveground storage tanks (UST or AST), waste dumping or landfilling, previous environmental investigations (e.g., groundwater monitoring wells) and storage of hazardous materials. The results of the site visits were then cross-referenced with the information gathered during the desktop assessment to determine which areas constitute APECs.

Each of the identified APECs were then assigned a risk-ranking of low, medium or high based on the likelihood of the operation having caused contamination in soil or groundwater within or near the existing lateral alignment. The factors considered when determining the likelihood included:

- Type and mobility of potential contaminants (metals vs hydrocarbons, etc.)
- Geographic location of the site or operation (downgradient vs upgradient)
- Age of potentially contaminating operations (older operations increase likelihood)
- Sophistication of operation (likelihood to have environmental policies)

When assigning a risk-ranking, the scale of the operations, distance from the lateral, the local topography and inferred groundwater flow direction, and the source and mobility of PCOCs were considered. The risk rankings can be further described as follows:

- Low-risk – Potentially contaminating operations were identified but are unlikely to have resulted in contamination within the Project alignment. Additional assessment work is not recommended to characterize the risk associated with each of the low-risk sites and there is not expected to be a cost for site management during Project construction. Should unexpected impacts be identified during the Project related to low risk areas, appropriate investigation and management activities would be assessed and completed at that time.
- Medium-risk - Potentially contaminating operations were identified that are likely to have resulted in some level of contamination within a portion of the Project alignment; although, the nature of the concern and proximity/location of the site may limit the overall liability during the construction phase. Further assessment is recommended to characterize the risk within each of the medium-risk APECs and there is expected to be a cost for site management during Project construction.
- High-risk – Operations with significant potential for contamination or confirmed contaminated sites that are likely to have resulted in contamination over a majority of the Project alignment width and further work would be required to determine the extent of the potential liability. Further assessment work is recommended to define the risk associated with each of the high-risk sites and there is expected to be a cost for site management during Project construction.

A summary of the findings of the desktop assessment for each lateral is provided in **Section 3.0**, and the APECs and affected segments of the lateral alignments are presented on **Figures KO-2 to KO-143**.

2.3 Fish Habitat

For the purposes of this report, fish habitat assessment includes all permanent and intermittent waterbodies and associated riparian vegetation within the 100 m study area.

A desktop review was conducted to obtain existing data on fish and fish habitat prior to PFR. Data was compiled from the following sources:

- Fisheries Information Summary System (MOE 2017)
- BC Species and Ecosystem Explorer (BC CDC 2018)
- COSEWIC (Government of Canada 2018)
- Aquatic Species at Risk online database (DFO 2018)
- HabitatWizard, iMapBC, and Freshwater Atlas (FWA) online mapping databases (DataBC 2018)
- Municipal and regional district online map data, where available

Species-specific details on their range, habitat requirements and their assessed potential to occur are provided in **Appendix C**. **Table 2.1** provides a list of information sources that were queried during this process. A search for known occurrences of fish species of concern, and species with federally-designated critical habitat within the study area was conducted within the study area for each lateral. For the purposes of this report, fish species of concern were defined as species that are listed under federal SARA, species afforded protection by the BC *Wildlife Act* (WA) and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)). The expanded 500 m study area was used for assessing potential presence of fish species of concern. The list of at-risk species was further refined based on their current known range and habitat suitability for each species assessed during the desktop studies and based on information gathered during PFR. Each species was then ranked according to it's potential to occur within the study area (i.e., nil, low, medium, or high[2]).

Fish species of concern that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report. Watercourse classification varies between regions and municipalities. Riparian setbacks for watercourses were calculated based on the applicable legislation within each municipality (e.g., the *Riparian Area Protection Act* (RAPA), formerly the Riparian Area Regulation (RAR)). Outside of municipal boundaries, the *Forest and Range Protection Act* (FRPA) stream classification model was used. Streamside Protection and Enhancement Areas (SPEA) were calculated for watercourses within municipalities governed by the RAPA (**Table 2.2**) and Riparian Management Areas (RMA) were calculated for watercourses within all other areas (**Table 2.3**).

[2] **Nil**: current understanding of the species' range and/or known species habitat associations suggests the species is not expected to occur within the study area. Species occurrence in the study area would be considered accidental.
Low: current understanding of the species' range and/or known species habitat associations suggests that the species is unlikely to occur within the study area with regularity or in adequate density to facilitate a functional population. Several ecological life-requisite stages would be challenged based on existing habitat conditions in the study area and/or connectivity with larger, more contiguous occurrence of the species.
Medium: current understanding of the species range and/or known species habitat associations suggests that the species is expected to occur in the study area on a temporary or regular (i.e., predictable) seasonal basis and in densities that facilitate persistence of a functional population within the study area.
High: current understanding of the species' range and/or known species habitat associations suggests that the species is expected to occur in the study area regularly, and in densities that would be expected to occur in provincial benchmark habitats.

During PFR activities, streams intersecting the study area were generally accessed by foot or vehicle on existing road infrastructure. Biophysical measurements (e.g., stream width, depth, gradient, and substrate type) were collected for each watercourse where it crossed the lateral, or at the nearest accessible location of select watercourses where lateral crossings were not accessible to field crews. obstructions to fish passage, unique channel characteristics (e.g., flood channels, braids, secondary channels, wetlands, bogs, depressions, etc.), and any other notable habitat features were also identified and recorded. Active fish sampling within the watercourses was not conducted during PFR activities. Where fish presence was unknown, the stream was conservatively classified as fish-bearing.

Table 2.2 SPEA Widths for Simple Assessment (RAR)

Vegetation Category	Existing or Potential Streamside Vegetation Conditions	SPEA Width		
		Fish Bearing	Non-fish Bearing	
			Permanent	Non-permanent
1 (> 15 m)	Continuous areas ≥ 30 m or discontinuous but occasionally > 30 m to 50 m	30 m	30 m	15 – 30 m
2 (10 – 15 m)	Narrow but continuous area = 15 m or discontinuous but occasionally > 15 m to 30 m	15 – 30 m	15 m	15 m
3 (< 10 m)	Very narrow but continuous areas up to 5 m or discontinuous but occasionally > 5 m to 15 m	15 m	5 – 15 m	5 – 15 m

Adapted from RAR Assessment Methods (2006)

Table 2.3 RMA Widths (FRPA) for Streams, Wetlands, and Lakes

Riparian Class	Watercourse Description	Riparian Management Area (m)
Streams		
S1A	≥ 100 m stream or active flood plain width; fish bearing	100
S1B	> 20 m width; fish bearing	70
S2	5 – 20 m width; fish bearing	50
S3	1.5 – < 5 m width; fish bearing	40
S4	< 1.5 m width; fish bearing	30
S5	> 3 m width; non-fish bearing	30
S6	≤3 m width; non-fish bearing	20
Wetlands		
W1	> 5 ha	50
W2	1 – 5 ha in PP, BG, IDF (xh, xw, xm), CDF, CWH (xm, dm, ds)	30
W3	1 - 5 ha in a biogeoclimatic zone or subzone other than one mentioned in W2	30
W4	• 0.25 – 1 ha in PP, BG, IDF (xh, xw, xm); or • 0.5 - 1 ha in CDF, CWH (xm, dm, ds)	30
W5	• two or more W1s within 100 m • a W1 and one or more non-W1 within 80 m • two or more non-W1s within 60 m • the combined area of wetlands is >= 5 ha	50

Riparian Class	Watercourse Description	Riparian Management Area (m)
Lakes		
L1-A	≥ 1,000 ha	0
L1-B	5 - 1,000 ha	10
L2	1 - 5 ha in PP, BG, IDF (xh, xw, xm), CDF, CWH (xm, dm, ds)	30
L3	1 - 5 ha in a biogeoclimatic zone or subzone other than one mentioned above	30
L4	• 0.25 – 1 ha in PP, BG, IDF (xh, xw, xm); or • 0.5 - 1 ha in CDF, CWH (xm, dm, ds)	30

Adapted from the *Forest and Range Practices Act*: Forest Planning and Practices Regulation (2004).

2.4 Vegetation

Vegetation values from **Table 2.1** were reviewed within a 100 m study area for each lateral. Desktop studies identified the following features within the study area for each lateral:

- BEC zones and subzones
- Areas of forest cover and dominant tree species (through analysis of aerial imagery and VRI polygons)
- Areas of old growth forest stands. For the purposes of this report, old growth was defined as:
  - Approved Old Growth Management Areas (OGMAs)
  - Stands with leading species with a projected age class of 8 or 9, depending on the Natural Disturbance Type of the BEC unit they in which they were found (BC MOFR and BC MELP 2010)
- Critical habitat for federally listed plant species at risk
- Known locations of invasive plants

Plant species and ecological communities of concern with the potential to occur in the study area for each lateral were also identified. For the purposes of this report, species and ecological communities of concern were defined as species that are listed under SARA and species that are included in the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018), as well as any red-or blue-listed plant species with a mapped CDC occurrence that overlaps or falls within the study area.

To determine the potential presence of species and ecological communities of concern, a query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify plant species and ecological communities that are known to occur in the BEC zones (species) and subzones (communities) that overlap with the 100 m study area for each lateral. The list of species was further refined based on the range and habitat suitability of each species and information collected during PFR. Species were ranked according to their potential to occur in the study area (i.e., nil, low, medium, or high). Species-specific details on range, habitat requirements and their assessed potential to occur is provided in **Appendix C**. Species that were determined to have a medium or high potential for occurrence within the study area are presented in the body of this report. Information regarding ecological communities is generally less-available than for individual species; therefore, ecological communities were not ranked according to potential for occurrence. All ecological communities identified within a BEC subzone that overlaps with the study area for a lateral were included within the report.

PFR activities collected data on vegetation community assemblage along the laterals. Areas of invasive or noxious weeds within or immediately adjacent to the ROW were recorded and geographically referenced. Areas of unique habitats encountered along the ROW that were considered to have potential to support at-risk plant species (e.g., areas of old growth forest, wetlands, rocky outcrops and seeps) were recorded and geographically referenced.

2.5 Wildlife

Wildlife values from **Table 2.1** were reviewed within an expanded 500-m study area for each lateral. This expanded study area was used to provide a conservative zone to identify recorded occurrences of species at risk, especially motile species (e.g., birds). Desktop studies identified the following designations and features when they occurred within the study area for each lateral:

- Important Bird Areas
- Approved Wildlife Habitat Areas (WHAs) [3]
- Wildlife Management Areas (WMAs)
- Approved Ungulate Winter Ranges (UWEs)
- Critical habitat for federally listed species at risk
- Previously mapped locations of osprey and eagle nests (WiTS)

For the purposes of this report, wildlife species of concern were defined as species that are listed under federal SARA, species whose nests are afforded specific consideration under Section 34b of the *Wildlife Act,* and species that fall under the OGC High Priority Wildlife species list (as outlined in the OGC Environmental Protection and Management Guideline (2018)). To determine the potential presence of wildlife of concern, a query of BC Conservation Data Center (CDC) Ecosystem Explorer was conducted to identify fish species known to occur in the BEC zones that overlap with an expanded 500 m study applied to each lateral. The list of at-risk species was further refined based on their current known range and habitat suitability for each species assessed during the desktop studies and based on information gathered during PFR. Each species was then ranked according to it's potential to occur within the study area (i.e., nil, low, medium, or high). **Appendix C** provides species-specific details on their range, habitat requirements and their assessed potential to occur. **Table 2.1** provides a list of information sources that were queried during this process. Wildlife species of concern that were determined to have a medium or high potential for occurrence within any of the study areas for a lateral are presented in the body of this report. A search for known occurrences of wildlife species of concern, and species with federally-designated critical habitat within the study area was conducted within the study area for each lateral.

During the PFR, observations of wildlife of concern and wildlife habitat features (e.g., raptor or heron nests, bird colonies, mineral licks, wallows, dens, burrows, and wildlife trees, etc.) were recorded, described and geographically referenced. Activity, behaviour and species abundance, where evident and relevant, was also noted.

[3] Proposed WHAs were not included as a consideration as management afforded to proposed WHAs is restricted to conservation of the wildlife habitat feature within each WHA. Where interim measures are required to ensure protection of a wildlife habitat feature within a proposed WHA the BC MFLNRORD is responsible for providing written notification to all affected parties, of the location and protection allotted to the wildlife habitat feature during the consultation phase of WHA designation. The request will solicit voluntary protection consistent with the candidate general wildlife measures. If no such request has been advanced there is no requirement for interim protection ((MWLAP 2004))

3.0 OVERVIEW OF EXISTING ENVIRONMENT

A description of the existing conditions related to each of the five environmental receptor categories is provided in the following sub-sections. Information collected during the desktop assessment and the PFR surveys is summarized below. Pertinent spatial environmental data (e.g., waterbodies, land use zoning, APECs) is presented on a set of Environmental Worksheets prepared for each lateral and are attached in **Appendix A**.

3.1 CEL LTL 168

The CEL 168 lateral is 5.8 km long and is aligned in an east to west direction on the south side of the Columbia River (**Figures KO-002** to **KO-005**). The east end of the lateral is located at the TRA CAS 219 and CEL LTL 168 tie-in crossover plant in east Castlegar, and the west end is located on the north side of Arrow Lake Drive, just south of the Interfor Mill.

This lateral was assessed by vehicle and UTV on May 31, 2018[4]. Access to private land was challenging, and sections of this lateral throughout the town were inaccessible. The PRS Site (Site #16), which is in an area of cleared land at the east end of the lateral, was accessed by vehicle. An overview of the identified environmental receptors within the study area is provided in **Sections 3.1.1** to **3.1.5**.

3.1.1 Land Use

Most of the lateral is in a utility corridor running through an undeveloped forested area. Much of the eastern portion of the lateral is within private land in the town of Castlegar, which is a highly disturbed urban area. Approximately 1.4 km of the lateral runs along the south side of ALR land. Both ends of the lateral are located within approximately 100 m of Canadian Pacific Railway (CPR) tracks.

The location of the proposed PRS is on a section of cleared land between mature forest (to the west), and a private residence with a cultivated field (to the north and east). A summary of the land use within the study area is provided in **Table 3.1.**

Table 3.1 Overview of Land Use within the CEL LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Crown Provincial: 34.3 **Private**: 74.0 **None**: 1.5	Central Kootenay	Castlegar (western and eastern ends)	-	14.8	4	**7:** 14.8

[4] At the time of field studies the entire alignment was assessed

3.1.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along CEL LTL 168 are provided in **Table 3.2.** No APECs were identified along CEL LTL 168.

Table 3.2 Summary of Areas of Potential Environmental Concern for CEL LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CEL LTL 168 (ILI)							
No APECs Identified							

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

3.1.3 Fish and Fish Habitat

Seven FWA mapped watercourses were identified within the CEL LTL 168 study area during desktop analysis. During PFR activities, three of these watercourses were observed to have no identifiable stream channel. Two watercourses were inaccessible (i.e., presence was not confirmed); however, they are conservatively being included as having potential to interact with gas main upgrade activities. A total of four watercourses potentially require riparian setbacks, depending on selected upgrade option and construction footprint.

All four watercourses cross the alignment within Electoral Area J of the Central Kootenay Regional District, beyond Celgar municipal boundaries; therefore, RMA setbacks are calculated as per FRPA. However, the PRS Site #16 construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity. Waterbodies are summarized in **Table 3.3** and biophysical descriptions are provided in **Appendix D**.

Desktop studies identified 3 fish species of concern with high potential to occur within the study area and two fish species of concern with medium potential to occur within the study area (**Table 3.4**). One species (i.e., White sturgeon (*Acipenser transmontanus)*) has known occurrences within the study area (**Table 3.5**).

Table 3.3 Summary of Waterbodies within the CEL LTL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CEL LTL 168_001	NSCI	0	No	Yes	N/A	N/A	KO-002
KO_CEL LTL 168_002	NSCI	0	No	Yes	N/A	N/A	KO-003
KO_CEL LTL 168_003	UKN	50	UKN	Yes	UKN	UKN	KO-003 KO-004
KO_CEL LTL 168_004	Stream permanent	0	UKN	Yes	S4	30	KO-003 KO-004
KO_CEL LTL 168_005	NSCI	0	No	Yes	N/A	N/A	KO-004
KO_CEL LTL 168_006	UKN	40	UKN	Yes	UKN	UKN	KO-004
KO_CEL LTL 168_007	Stream permanent	0	UKN	Yes	S3	40	KO-004

NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.4 Fish species of Concern with Medium or High Potential to Occur in the CEL LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium
Shorthead Sculpin	*Cottus confusus*	1-SC	SC (Nov 2010)	Blue	Yes	-	Medium
Umatilla Dace	*Rhinichthys umatilla*	3 (Mar 2005)	T (Apr 2010)	Red	-	-	High
White Sturgeon (Columbia River population)	*Acipenser transmontanus pop. 2*	1-E (Aug 2006)	E (Nov 2012)	Red	Yes	-	High (CDC Occurrence)

SC = special concern; E = endangered = T = threatened

Table 3.5 Fish Species of Concern with Known Occurrences or Critical Habitat in the CEL LTL 168 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Alignment (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Alignment (m)	Overlap with Study Area (m^2)	Comments
White Sturgeon (Columbia River Population)	279	137,130	Last confirmed observation was in 2004. Observations were confined to the Columbia River, which has minimal overlap with northwest section of study area	-	-	-

3.1.4 Vegetation

The CEL LTL 168 study area is located within the transition zones between the Interior Cedar-Hemlock Dry Warm (ICHdw) and Interior Cedar-Hemlock Very Dry Warm (ICHxw) subzones, with most of the lateral located in the ICHxw subzone (Ketcheson et al. 1991). Both subzones are found at lower to middle elevations of southeastern BC and are dominated by upland coniferous forests. In mature forest, both subzones typically have western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) (or both) as dominant species. Early- and mid- seral species are common, including western larch (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii*), western white pine (*Pinus monticola)*, ponderosa pine (*P. ponderosa*), lodgepole pine (*P. contorta*), trembling aspen (*Populus tremuloides)*, and paper birch (*Betula papyrifera)* (Ketcheson et al. 1991).

The VRI data shows vegetation within the study area to consist of a mix of mature (i.e., age classes 5 to 8) mixed and coniferous forests, with dominant species including western larch, trembling aspen, and paper birch (DataBC, 2018). No legal OGMAs were identified within the study area during the desktop studies; however, there is one stand of old growth forest (i.e., age class 8) covering approximately 2.7 ha is mapped by the VRI within the study area,(this area does not overlap with the proposed location of the PRS (Site #16)). The proposed location of the PRS (Site #16) is located in an area of cleared vegetation which has grown in with grasses and small shrubs including salmonberry (*Rubus spectabilis*). A patch of mature mixed forest is located immediately west of the PRS Site.

No invasive vegetation was identified in the study area during the desktop search. One site of spotted knapweed (*Centaurea biebersteinii)*, which is provincially noxious, was identified during the PFR (**Figure KO-003**).

Desktop studies did not identify any plant species of concern with medium or high potential to occur within the study area. No plant species of concern have mapped CDC occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Three at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.6**); although, none of these at-risk ecological communities have mapped CDC occurrences in the study area (DataBC 2018).

Table 3.6 At-Risk Ecological Communities with Potential to Occur in the CEL LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Ecological communities						
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Douglas-fir / tall Oregon-grape / parsley fern	*Pseudotsuga menziesii / Berberis aquifolium / Cryptogramma acrostichoides*	-	-	Red	Yes	X
Western hemlock / common snowberry	*Tsuga heterophylla / Symphoricarpos albus*	-	-	Red	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.1.5 Wildlife

The CEL LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area, and the entire length of the lateral, is located within an approved UWR (# U-4-001). For the portion of UWR # 4-001 that overlaps with the study area, mule deer (*Odocoileus hemionus*) is the focal management species (DataBC). Most of the study area, and the entire length of the lateral, is also located within an approved WHA for grizzly bear (WHA 8-373). No observations of wildlife of concern or wildlife habitat features were recorded during the PFR.

Habitat present within the study area is dominated by mature (i.e., age class 5 to 8) mixed forest and coniferous forest, and includes a cleared RoW and riparian areas. These habitat types may provide foraging and nesting habitat, as well as movement corridors (including migration and dispersal) for a variety of wildlife, including species of concern.

Desktop studies identified 22 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.7**). Three of these species have mapped CDC occurrences within the study area. No wildlife species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Similarly, there were no mapped masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018). No observations of wildlife or wildlife habitat features were recorded during PFR at the proposed PRS location.

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Table 3.7 Wildlife of Concern with Medium or High Potential to Occur in the CEL LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	Medium
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	High
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Bobolink	*Dolichonyx oryzivorus*	1-T (Nov 2017)	T (Apr 2010)	Blue	Yes	-	Medium
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	Medium
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Coeur d'Alene Salamander	*Plethodon idahoensis*	1-SC (Jun 2003)	SC (Nov 2007)	Yellow	-	-	Medium
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Reptiles / Turtles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	Medium
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.8 Wildlife of Concern with Mapped CDC Occurrences in the CEL LTL 168 Study Area

English Name	Mapped CDC Occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Bobolink	9	83,381	Historic observation (1994) from east side of Columbia River in grassy field. Observation has minimal overlap with southeast section of study area
Lewis's Woodpecker	Overlap	6,376,133	Surveys in 2006 found no nests or individual birds. Historic observation from 1998 (nesting pair with two young) was last confirmed occurrence. Observation overlaps with nearly entire study area

3.2 CAS NEL 168

CAS NEL 168 is 37.4 km in length and is oriented in a generally southwest to northeast direction along the Kootenay River Valley between Castlegar and Nelson (**Figures KO-005** to **KO-028**). The lateral was assessed from May 29 to May 31, 2018. Access to much of this lateral was challenging due to dense urban areas, fenced private land, and steep cliff facings.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.2.1**to **3.2.5.**

3.2.1 Land Use

The west end of the CAS NEL 168 is in Castlegar, BC. Northeast of Castlegar, the lateral crosses the Columbia River and a set of CPR tracks and is oriented roughly parallel to Highway 3A along the west side of the Kootenay River, passing though a mix of forested areas and agricultural fields. The lateral crosses Highway 3A and CPR tracks at approximately chainage 16+4 and crosses the confluence of the Slocan and Kootenay rivers approximately 1 km to the east. On the east side of the Kootenay River, the lateral is oriented along an existing powerline RoW, then through an area of primarily undeveloped forest. The northeast end of the lateral is in the City of Nelson.

The location of the proposed PRS is at the southwest end of the lateral at the Castlegar – Valve Assembly Station, located just east of Columbia Avenue in Castlegar, BC.

A summary of the land use within the study area is provided in **Table 3.9**.

Table 3.9 Overview of Land Use within the CAS NEL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Crown Agency: 16.4 **Crown Provincial**: 105.7 **Municipal**: 13.8 **Private**: 465.9 **None**: 58.6 **Unknown**: 0.4 **Mixed Ownership:** 0.1	Central Kootenay	Castlegar (southern end), Nelson, Communities of Thrums and Tarrys	The alignment crosses Millennium Park, a municipal park in Castlegar located along the banks of the Columbia River, with beaches, trails, and recreation facilities. The alignment also crosses the access road and suspension bridge to Zuckerberg Island Heritage Park at the southern end of Millennium Park The alignment also crosses Morning Mountain about 4.5 km east of Nelson, a provincial Authorized Trail Area with several trails used for hiking and mountain biking	56.5	34	**3:** 7.2 **4:** 32.4 **5:** 3.3 **6:** 11.4 **7:** 2.0

3.2.2 Contaminated Sites

Details of the seven APECs identified through the desktop assessment along CAS NEL 168 are provided in **Table 3.10**. Of the identified APECs, three are medium risk, one is high risk and the remaining three are low risk.

Table 3.10 Summary of Areas of Potential Environmental Concern for CAS NEL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CAS NEL 168 (PRS)							
S1	Auto repair shop - Columbia Auto Service (1050 and 1044 Columbia Avenue, Castlegar)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Site Reg (Site ID 9593)	Adjacent	Medium	55	KO-005
S2	Fortis office / operations building (1037 Columbia Avenue N, Castlegar)	PCBs	Waste Generation	25 m north	Low	50	KO-005
S3	Historical Castlegar landfill (625 to 661 5th Avenue, Castlegar)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Site Reg (Site ID 5680)	On-Site	High	770	KO-006
S4	Boulder Patch Trucking – Soil management and relocation (1071 Lazeroff Road, Castlegar)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Eris Ecolog (AMS/SCT)	On-Site	Medium	240	KO-015
S5	Active Esso Service Station (2347 BC-3A, Castlegar)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	50 m east	Low	110	KO-015
S6	Railway crossing (east of intersection of Highway 3A and Goose Greek Road)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	25	KO-016
S7	Autobody Shop - Nelson Chrysler (1410 Granite Rd, Nelson)	BTEX/VPH, EPH, PAHs, VOCs, metals, glycols	Eris Ecolog (AUWR)	30 m east	Low	170	KO-028

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

3.2.3 Fish and Fish Habitat

Thirty-eight FWA mapped watercourses were identified within the CAS NEL 168 study area during desktop analysis. During PFR activities, four FWA mapped watercourses were observed to have no identifiable stream channel, and an additional 10 unmapped waterbodies were observed and subsequently characterized and mapped. Seven watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected) and are therefore rated conservatively as they have potential to interact with gas main upgrade activities. A total of 44 watercourses potentially require riparian setbacks, depending on selected upgrade option and construction footprint.

Sixteen watercourses (KO_CAS NEL 186_031 to 046) are located within Electoral Area E of the Central Kootenay Regional District, which has adopted RAR setbacks (i.e., SPEA) for activities that require a Watercourse Development Permit (**Section 4.4.1**). The remaining 28 watercourses require RMA setbacks as per FRPA. However, the PRS Site #18 construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity.

Waterbodies are summarized in **Table 3.11** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified six fish species of concern with high potential to occur within the study area and one fish species of concern with medium potential to occur within the study area (**Table 3.12**). Five of the species have known occurrences within the study area (**Table 3.13**).

Table 3.11 Summary of Waterbodies within the CAS NEL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA classification	RMA (m)	Figure Reference
KO_CAS NEL 168_001	NSCI	0	No	Yes	N/A	N/A	KO-006
KO_CAS NEL 168_002 (Columbia River)	Stream - permanent	0	Yes	Yes	S1A	100	KO-006 KO-007
KO_CAS NEL 168_003	NSCI	0	No	Yes	N/A	N/A	KO-007 KO-008
KO_CAS NEL 168_004	UKN	0	UKN	Yes	UKN	UKN	KO-008
KO_CAS NEL 168_005	UKN	0	UKN	Yes	UKN	UKN	KO-008
KO_CAS NEL 168_006	NSCI	0	No	Yes	N/A	N/A	KO-009
KO_CAS NEL 168_007	UKN	0	UKN	Yes	UKN	UKN	KO-009
KO_CAS NEL 168_008	Stream - permanent	0	UKN	Yes	S4	30	KO-009
KO_CAS NEL 168_009	Stream - intermittent	0	UKN	Yes	S4	30	KO-010
KO_CAS NEL 168_010 (Ezra Creek)	Stream - permanent	0	UKN	Yes	S4	30	KO-010

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA classification	RMA (m)	Figure Reference
KO_CAS NEL 168_011	NSCI	0	No	Yes	N/A	N/A	KO-011
KO_CAS NEL 168_012	NSCI	0	No	Yes	N/A	N/A	KO-010 KO-11
KO_CAS NEL 168_013	Stream - permanent	0	UKN	Yes	S4	30	KO-010 KO-11
KO_CAS NEL 168_014	NSCI	0	No	Yes	N/A	N/A	KO-011
KO_CAS NEL 168_015	NSCI	0	No	Yes	N/A	N/A	KO-011
KO_CAS NEL 168_016	NSCI	0	No	Yes	N/A	N/A	KO-012
KO_CAS NEL 168_017	NSCI	0	No	Yes	N/A	N/A	KO-012
KO_CAS NEL 168_018	NSCI	0	No	Yes	N/A	N/A	KO-012
KO_CAS NEL 168_019	Stream - permanent	0	UKN	Yes	S2	50	KO-013
KO_CAS NEL 168_020	Stream - permanent	0	UKN	Yes	S4	30	KO-013
KO_CAS NEL 168_021	NSCI	0	No	Yes	N/A	N/A	KO-013
KO_CAS NEL 168_022	NSCI	0	No	Yes	N/A	N/A	KO-014
KO_CAS NEL 168_023	UKN	0	UKN	Yes	UKN	UKN	KO-014
KO_CAS NEL 168_024	Wetland	0	UKN	Yes	W3	30	KO-014
KO_CAS NEL 168_025	UKN	0	UKN	Yes	UKN	UKN	KO-014
KO_CAS NEL 168_026	NSCI	0	No	Yes	N/A	N/A	KO-015
KO_CAS NEL 168_027 (Durham Creek)	NSCI	0	No	Yes	N/A	N/A	KO-015
KO_CAS NEL 168_028 (Slocan River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-016
KO_CAS NEL 168_029	Stream - permanent	0	Yes	Yes	S1A	100	KO-016
KO_CAS NEL 168_030	Stream - intermittent	0	UKN	Yes	S4	30	KO-017
KO_CAS NEL 168_031	Stream - intermittent	0	UKN	Yes	S4	30	KO-017

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA classification	RMA (m)	Figure Reference
KO_CAS NEL 168_032	Stream - intermittent	0	UKN	Yes	S4	30	KO-017
KO_CAS NEL 168_033 (Rover Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-018
KO_CAS NEL 168_034 (Bird Creek)	Stream - permanent	0	Yes	Yes	UKN	UKN	KO-020
KO_CAS NEL 168_035 (Forty-nine Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-021 KO-022
KO_CAS NEL 168_036 (Eagle Creek)	Stream - permanent	0	Yes	Yes	SPEA[1]: 30 m		KO-024
KO_CAS NEL 168_037 (Sandy Creek)	Stream permanent	0	Yes	Yes	SPEA[1]: 30 m		KO-025
KO_CAS NEL 168_038 (Smelter Creek)	Stream - permanent	0	Yes	Yes	SPEA[1]: 30 m		KO-028
KO_CAS NEL 168_039	Stream - permanent	0	UKN	No	SPEA[1]: 30 m		KO-028
KO_CAS NEL 168_040	Stream - intermittent	0	UKN	No	SPEA[1]: 30 m		KO-028
KO_CAS NEL 168_041	Stream - permanent	0	UKN	No	SPEA[1]: 30 m		KO-027
KO_CAS NEL 168_042	Wetland	0	UKN	No	SPEA[1]: 30 m		KO-026
KO_CAS NEL 168_043	NCD	0	UKN	No	SPEA[1]: 30 m		KO-024
KO_CAS NEL 168_044	NCD	0	UKN	No	SPEA[1]: 30 m		KO-023
KO_CAS NEL 168_045	NCD	0	UKN	No	SPEA[1]: 30 m		KO-023
KO_CAS NEL 168_046	Wetland	0	UKN	No	SPEA[1]: 30 m		KO-028
KO_CAS NEL 168_047	Wetland	0	UKN	No	N/A*	N/A	KO-014
KO_CAS NEL 168_048	Stream - permanent	0	UKN	No	UKN	UKN	KO-011

NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

*wetland < 1 ha in ICH biogeoclimatic zone; no FRPA classification.

[1] as calculated from a Simple Assessment

Table 3.12 Fish Species of Concern with Medium or High Potential to Occur in the CAS NEL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Columbia Sculpin	*Cottus hubbsi*	1-SC (Jun 2003)	SC (Nov 2010)	Blue	Yes	-	High (CDC Overlap)
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium
Shorthead Sculpin	*Cottus confusus*	1-SC	SC (Nov 2010)	Blue	Yes	-	High (CDC Occurrence)
Umatilla Dace	*Rhinichthys umatilla*	3 (Mar 2005)	T (Apr 2010)	Red	-	-	High (CDC Occurrence)
White Sturgeon (Columbia River population)	*Acipenser transmontanus pop. 2*	1-E (Aug 2006)	E (Nov 2012)	Red	Yes	-	High (CDC Occurrence)
White Sturgeon (Kootenay River population)	*Acipenser transmontanus pop. 1*	1-E (Aug 2006)	E (Nov 2012)	Red	Yes	-	High (CDC Occurrence)

SC = special concern; E = endangered = T = threatened

Table 3.13 Fish Species of Concern with Known Occurrences or Critical Habitat in the CAS NEL 168 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Alignment (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Alignment (m)	Overlap with Study Area (m^2)	Comments
Columbia Sculpin	97	61,819	Historic observation (1987) of one specimen in the Kootenay River, just south of confluence with Goose Creek near chainage 17+3	-	-	-
Shorthead Sculpin	147	16,148	Historic observation from 1988 (four specimens) was the last confirmed occurrence in Goose Creek, just upstream from confluence with Kootenay River. Approximate locations chainage 16+9	-	-	-
Umatilla Dace	3 occurrences, 1 that is overlapping	258,954	The last recorded occurrence was in 1988 in Kootenay River at the confluence with Goose Creek (three specimens). Also, historic observations further upstream of Kootenay River and slightly upstream of Goose Creek at approximate locations from chainages 16+9 to 20+4	-	-	-
White Sturgeon (Columbia River Population)	Overlap	646,863	Last confirmed observation was in 2004. Observations are confined to the Columbia River, which overlaps with southwest section of study area. Lateral crosses Columbia River (occurrence location) from chainages 1+8 to 2+2	-	-	-
White Sturgeon (Kootenay River Population)	117	485,821	Last confirmed observation was in 2002. Observations are confined to the section of the Kootenay River with minimal overlap with northeast section of study area	-	-	-

3.2.4 Vegetation

The CAS NEL 168 study area is located within the transition zones between the ICHdw subzone at higher elevations and the ICHxw subzone in areas of lower elevation at the bottom of the Kootenay River valley (Ketcheson et al. 1991). Vegetation within the study area varies and includes areas of young and mature forest (ranging from age class 1 to 8 (DataBC, 2018)), cleared fields, and vegetation associated with urban areas and parks. No legal OGMAs were identified within the study area during the desktop studies; however, stands of old growth forest (i.e., class 8) covering an approximate area of 29.2 ha are shown by the VRI within the study area (DataBC 2018).

Approximately 14.0 ha of invasive vegetation (comprised of 22 species and distributed over 30 sites) were identified in the study area during the desktop search. Fifty-one additional sites of invasive vegetation were identified within the study area during the PFR (**Table 3.14**).

Table 3.14 Invasive Vegetation Identified within the CAS NEL 168 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Bohemian knotweed	*Reynoutria x bohemica*	BO	Noxious (Provincially)
Bull thistle	*Cirsium vulgare*	BT	Invasive
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Eurasian watermilfoil	*Myriophyllum spicatum*	EW	Invasive
Hoary alyssum	*Berteroa incana*	HA	Noxious (Regionally)
Himalayan blackberry	*Rubus armeniacus*	HI	Invasive
Hawkweed species	*Hieracium spp*	HS	Noxious (Regionally)
Policeman's helmet / Himalayan balsam	*Impatiens glandulifera*	IM	Invasive
Mullein	*Verbascum thapsis*	MU	Invasive
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Purple loosestrife	*Lythrum salicaria*	PL	Noxious (Provincially)
Rush skeletonweed	*Chondrilla juncea*	RS	Noxious (Provincially)
Scotch broom	*Cytisus scoparius*	SB	Invasive
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
St. John's wort/ Goatweed	*Hypericum perforatum*	SJ	Invasive
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
Yellow iris	*Iris pseudachorus*	YI	Noxious (Provincially)
	Number of Species		22
	Number of Sites		81
	Total Area (m^2)		140,100

Desktop studies identified three provincially blue or red-listed plant species with medium or high potential to occur within the study area, based on mapped CDC occurrences (**Table 3.15** and **Table 3.16**). No other plant species of concern have mapped CDC occurrences within the study area, and no plant species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Three at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.15**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.15 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CAS NEL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Heterocodon	*Heterocodon rariflorus*	-	-	Blue	-	Medium
Howell's Quillwort	*Isoetes howellii*	-	-	Blue	-	High
Monardella	*Monardella odoratissima* ssp. *discolor*	-	-	Red	-	Medium
Ecological Communities						
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Douglas-fir / tall Oregon-grape / parsley fern	*Pseudotsuga menziesii / Berberis aquifolium / Cryptogramma acrostichoides*	-	-	Red	Yes	X
Western hemlock / common snowberry	*Tsuga heterophylla / Symphoricarpos albus*	-	-	Red	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.16 Plants of Concern with Mapped CDC occurrences in the CAS NEL 168 Study Area

English Name	Scientific Name	Mapped CDC occurrences		
		Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Heterocodon	*Heterocodon rariflorus*	Overlaps	1,332,220	Mapped occurrence is from a historic observation dating from 1942 and overlaps the northeastern end of the study area (approximately 7 km of the lateral) (DataBC, 2018)
Howell's Quillwort	*Isoetes howellii*	25	1,996	Mapped occurrence is from observation from 2010, when approximately 50 plants were found in a receded river channel in Zuckerberg Island Park, north of Island Zuckerberg Road. (DataBC 2018)
Monardella	*Monardella odoratissima* ssp. *discolor*	Overlaps	1,945,803	Mapped occurrence is from a historic observation in Nelson dating from 1956 and overlaps the northeastern end of the study area (approximately 10 km of lateral) (DataBC 2018)

3.2.5 Wildlife

The CAS NEL 168 study area does not overlap with any mapped raptor nests, IBAs or provincial approved WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Except for some higher elevation areas on the south side of the Kootenay River, most of the study area is located within an approved UWR (# U-4-001) for mule deer. The portion of the study area that is west of the Columbia River (approximately 1.8 km of lateral) is located within an approved WHA for grizzly bear (WHA 8-373). Field crews recorded and described two observations of wildlife of concern and wildlife habitat features during PFR (**Table 3.17**).

Table 3.17 Wildlife and Wildlife Habitat Features Observed in the CAS NEL 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Two mule deer (*Odocoileus hemionus)* observed in grassy area adjacent to RoW	KO-021
W003	Unidentified conspicuous stick nest in conifer tree on RoW	KO-008

Wildlife habitat available within the study area included areas of young and mature forests (i.e., age classes 1 to 8), cleared RoWs, agricultural fields, wetlands and riparian areas. Available habitat may provide foraging, security and thermal habitat, as well as areas for nesting, denning and breeding. The habitat present is suitable for a variety of wildlife, including species of concern. Desktop studies identified 23 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.18**). Four of these species have mapped CDC occurrences within the study area and two have federally-designated critical habitat polygons within the study area (DataBC 2018) (Table 3.19). Desktop studies did not identify any mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.18 Wildlife of Concern with Medium or High Potential to Occur in the CAS NEL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	Medium
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	High
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Bobolink	*Dolichonyx oryzivorus*	1-T (Nov 2017)	T (Apr 2010)	Blue	Yes	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	Medium
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow			High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Coeur d'Alene Salamander	*Plethodon idahoensis*	1-SC (Jun 2003)	SC (Nov 2007)	Yellow	-	-	Medium
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	Medium
Western Skink	*Plestiodon skiltonianus*	1-SC (Jan 2005)	SC (Nov 2014)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.19 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the CAS NEL 168 Study Area

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Alignment (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Alignment (m)	Overlap with Study Area (m^2)	Comments
Bobolink	9	445,727	Historic observation (1994) from east side of Columbia River and south side of Kootenay River in a grassy field. Observation has minimal overlap with southwest section of study area	-	-	-
Caribou	-	-	-	Overlaps	18,699,982	Federally-designated (final status) polygon overlaps northeastern part of study area, beginning around chainage 18+1. Study area is along northwestern portion of polygon, which extends to Kootenay Lake in the east and the Canada/USA border to the south Lateral overlaps low elevations of the polygon, where specific features that are considered critical habitat include: forests of cedar, hemlock and spruce; avalanche chutes, burns, and mineral licks (ECCC, 2014)
Lewis's Woodpecker	Overlap	2,796,309	Surveys in 2006 found no nests or individual birds. Historic observation from 1998 (nesting pair with two young) was last confirmed occurrence. Observation overlaps with southwest portion of study area from approximate from chainage 0+0 to 2+5	Overlaps	501,525	Federally-designated (final status) polygon falls entirely within study area, overlapping chainages 0+9 and 1+3. Within polygon, critical habitat is identified where known and potential nesting trees exist (alive, standing or dead), plus a 400 m buffer around where key foraging habitat attributes (standing trees not exceeding 35% canopy closure and presence of fruit-bearing shrubs and perennial grasses) are present (ECCC, 2017)

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Alignment (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Alignment (m)	Overlap with Study Area (m^2)	Comments
Painted Turtle - Intermountain - Rocky Mountain Population	474	4,098	Historic observation (2003) from south side of Kootenay River, across from approximate chainage 5+3	-	-	-
Western Screech-owl, Macfarlanei Subspecies	Overlap	1,587,587	Historic observation (1971) in northeast section of study area. Observation occurrence overlaps with study area from approximate chainage 35+8 to 37+4	-	-	-

3.3 TRA LTL 168

The TRA 168 lateral is 4.2 km long, located northwest of Trail and is oriented in a north to south direction. The northeast end of the lateral is in an undeveloped forested area and the south end is located within the municipal bounds of Trail, BC, north of the Teck Trail operations. (**Figures KO-029** to **KO-031**). On May 28, 2018 the TRA LTL 128 lateral was assessed primarily on foot due to limited access in the field.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.3.2 to 3.3.5**.

3.3.1 Land Use

TRA LTL 168 runs through undeveloped forest lands and industrial areas associated with the Teck Trail operations. Most of the lateral is located within private land and includes ALR land. The lateral is located on the west side of Highway 22 between approximate chainages 3+06 and 3+35. The proposed location of the PRS is at the north end of the lateral, in a cleared area surrounded by forest.

A summary of the land use within the study area is provided in (**Table 3.20**).

Table 3.20 Overview of Land Use within the TRA LTL168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Private: 81.8 **None**: 0.5 **Unknown**: 0.2	Kootenay Boundary	Trail	-	14.2	5	**5:** 7.6 **7:** 6.6

3.3.2 Contaminated Sites

Details of the nine APECs identified through the desktop assessment along TRA LTL 168 are provided in **Table 3.21**. Of the identified APECs, one is low risk, one is medium risk and the remaining seven are high risk.

Table 3.21 Summary of Areas of Potential Environmental Concern for Lateral TRA LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Alignment	Risk Classification	Length (m)	Figure
TRA LTL 168 (PRS)							
T1	FortisBC pump station – Site Registry entry noting mercury contamination (250m north of Bingay Road, Trail)	Mercury	Site Reg (Site ID 2721)	On-Site	High	20	KO-031
T2	BC Hydro transformer station (north of Bingay Road, Trail)	BTEX/ VPH, EPH, PAHs, PCBs, Metals	Aerial Imagery	80 m south	Low	90	KO-031
T3	Cominco open burn site and landfill with Site Registry entry (west of Aldridge Avenue, Trail)	Metals, PCBs	Site Reg (Site ID 3755)	Adjacent	High	425	KO-031
T4	Metallurgical landfill - Trail smelter (west of Aldridge Avenue, Trail)	Metals	Eris Ecolog (AMS)	Adjacent	High	225	KO-031
T5	Arsenic dump with Site Registry entry - Trail smelter (west of Aldridge Avenue, Trail)	Arsenic, Metals	Site Reg (Site ID 66)	Adjacent	High	370	KO-031
T6	Trail smelter facility – Teck Cominco (east of Aldridge Avenue, Trail)	Metals	Ecolog Eris (Waste Generation)	115 m east	Medium	2722	KO-031
T7	Smelter laydown area with Site Registry entry – Teck Cominco Trail smelter (west of Aldridge Avenue, Trail)	Metals	Site Reg (Site ID 3754)	50 m west	High	445	KO-031
T8	Former landfill and service station with Site Registry entry (Directly north of Stoney Creek on east side of Highway 22, Trail)	BTEX/VPH, EPH, PAHs, metals	Site Reg (Site ID 3757)	30 m east	High	90	KO-031

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Alignment	Risk Classification	Length (m)	Figure
T9	Coal Pile - Trail Smelter (east of Highway 22, Trail)	PAHs, metals	EM	30 m east	High	170	KO-030

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

3.3.3 Fish and Fish Habitat

Two FWA mapped watercourses were identified within the TRA LTL 168 study area during desktop analysis. During PFR activities, two additional unmapped waterbodies (i.e., wetlands) were observed and subsequently mapped. The two wetlands are within the ICH biogeoclimatic zone and less than 1 ha in size; therefore, they do not have a FRPA classification and do not require a riparian setback. Two watercourses (KO_TRA LTL 168_001 and 002) potentially require riparian setbacks, depending on selected upgrade option and construction footprint. These watercourses are within the Regional District of Kootenay Boundary Electoral Area B, which requires a Development Permit for activities within riparian areas (**Section 4.4.2**). However, the PRS Site #19 construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity.

Waterbodies are summarized in **Table 3.22** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified four fish species of concern with high potential to occur within the study area and one fish species of concern with medium potential to occur within the study area (**Table 3.23**). One of the species has known occurrences within the study area (**Table 3.24**).

Table 3.22 Summary of Waterbodies within the TRA LTL168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_TRA LTL 168_001 (Topping Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-031
KO_TRA LTL 168_002	Stream - permanent	0	UKN	Yes	S4	30	KO-029 KO-030
KO_TRA LTL 168_003	Wetland	0	UKN	No	N/A*	N/A	KO-030
KO_TRA LTL 168_004	Wetland	0	UKN	No	N/A*	N/A	KO-029

NSCI = no stream channel identified; N/A = not applicable; UKN = Unknown
*wetland < 1 ha in ICH biogeoclimatic zone; no FRPA classification.

Table 3.23 Fish Species of Concern with Medium or High Potential to Occur in the TRA LTL168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium
Shorthead Sculpin	*Cottus confusus*	1-SC	SC (Nov 2010)	Blue	Yes	-	High
Umatilla Dace	*Rhinichthys umatilla*	3 (Mar 2005)	T (Apr 2010)	Red	-	-	High
White Sturgeon (Columbia River population)	*Acipenser transmontanus pop. 2*	1-E (Aug 2006)	E (Nov 2012)	Red	Yes	-	High (CDC Occurrence)

SC = special concern; E = endangered = T = threatened

Table 3.24 Fish Species of Concern with Known Occurrences or Critical Habitat in the TRA LTL168 Study Area

English Name	Known Occurrences			Critical Habitat		
	Distance from Alignment (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Alignment (m)	Overlap with Study Area (m^2)	Comments
White Sturgeon (Columbia River Population)	454	7,017	Last confirmed observation was in 2004. Observations were confined to the Columbia River, which is separated from TRA LTL 168 by Highway 22, leaving minimal overlap with east section of study area	-	-	-

3.3.4 Vegetation

The TRA LTL168 study is located within the ICHxw subzone. Vegetation within most of the study area consists of predominantly deciduous forest, ranging from age classes 3 to 5 (Data BC, 2018). The southern portion of the study area near the Teck Mine is generally unforested or sparsely forested. No legal OGMAs or areas of old growth forest were identified within the study area during the desktop studies.

Approximately 12 m² of invasive vegetation (comprised of two species and distributed over four sites) were identified in the study area during the desktop search (**Table 3.25**). No additional invasive plants were identified during the PFR.

Table 3.25 Invasive Vegetation Identified within the TRA LTL168 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Policeman's helmet / Himalayan balsam	*Impatiens glandulifera*	IM	Invasive
Scotch broom	*Cytisus scoparius*	SB	Invasive
	Number of Species		2
	Number of Sites		4
	Total Area (m^2)		12

Desktop studies identified three provincially blue or red-listed plant species with medium or high potential to occur within the study area based on mapped CDC occurrences (**Table 3.26** and **Table 3.27**). No other plant species of concern have mapped CDC occurrences within the study area, and no plant species have federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Two at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.26**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.26 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the TRA LTL168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Blunt-sepaled starwort	*Stellaria obtusa*	-	-	Blue	-	Medium
Long-leaved aster	*Symphyotrichum ascendens*	-	-	Red	-	Medium
Tall bluebells	*Mertensia paniculata* var. *borealis*	-	-	Blue	-	Medium
Ecological communities						
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Western hemlock / common snowberry	*Tsuga heterophylla / Symphoricarpos albus*	-	-	Red	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.27 Plants of Concern with Mapped CDC occurrences in the TRA LTL 168 Study Area

English Name	Mapped CDC occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Blunt-sepaled Starwort	Overlaps	869,719	Mapped occurrence is from a historic observation in Trail and overlaps the entire study area (Data BC, 2018)
Long-leaved Aster	Overlaps	869,719	Mapped occurrence is from a historic observation in Trail and overlaps the entire study area (Data BC, 2018)
Tall Bluebells	Overlaps	869,719	Mapped occurrence is from a historic observation in Trail and overlaps the entire study area (Data BC, 2018)

3.3.5 Wildlife

The TRA LTL 168 study area does not overlap with any mapped raptor nests, IBAs, or provincial approved WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Except for the Columbia River, the entire study area is located within an approved UWR (# U-4-001) for mule deer. The study area is located entirely within an approved WHA for grizzly bear (WHA 8-373). No observations of wildlife of concern or wildlife habitat features were recorded during the PFR.

Wildlife habitat present within the study area include predominantly deciduous forest (ranging from age classes 3 to 5), cleared fields, and riparian areas. Much of the habitat within the southern portion of the study area has been modified by mining and industrial activity and has limited suitability for use by wildlife. Nevertheless, forested areas, fields and riparian corridors present within the study area may provide foraging and nesting habitat for a variety of wildlife species, including species of concern.

Desktop studies identified 22 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.28**). None of these species have mapped CDC Occurrences within the study area or federally-designated critical habitat polygons within the study area (DataBC 2018). Similarly, no mapped masked (i.e., confidential) CDC occurrences occur within the study area (DataBC 2018).

Table 3.28 Wildlife of Concern with Medium or High Potential to Occur in the TRA LTL168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	Medium
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Fringed Myotis	*Myotis thysanodes*	3 (Mar 2005)	DD (May 2004)	Blue	-	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	High
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	Medium
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	Medium
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	Medium
Osprey	*Pandion haliaetus*	-	-	Yellow			
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Yellow-breasted Chat	*Icteria virens*	1-E (Jun 2003)	E (Nov 2011)	Red	Yes	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	Medium

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Reptiles							
North American Racer	*Coluber constrictor*	1-SC (Aug 2006)	T (Nov 2015)	Blue	Yes	-	High
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Western Skink	*Plestiodon skiltonianus*	1-SC (Jan 2005)	SC (Nov 2014)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

3.4 KBY LTL 168

The KBY LTL 168 alignment is 20.6 km long and is oriented in a general northwest direction from McPhee Road Control Station just north of Cranbrook, through Marysville, and its north end at the Stub Service Site in Kimberly, BC (**Figures KO-032** to **KO-044**). This lateral was assessed on June 6, 2018 by UTV. An overview of the identified environmental receptors within the study area is provided in **Sections 3.4.1** to **3.4.5**.

3.4.1 Land Use

South of St. Mary River, the KBY LTL 168 is located through a mix of forested areas and private rural properties. The lateral crosses St. Mary River at approximate chainage 9+6. North of St. Mary River, the lateral crosses Highway 95A and the community of Wycliffe. From here, it roughly parallels Highway 95A in a northwest direction to Kimberly, BC. The north end is located along the edge of the former Cominco Fertilizer Mine. The majority of KBY LTL 168 runs through ALR land, with much of the alignment is located on private land. A summary of the land use within the study area is provided in **Table 3.29**.

Table 3.29 Overview of Land Use within the KBY LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Provincial: 42.0 **Municipal:** 24.0 **Private:** 319.1 **None**: 13.0	East Kootenay	Cranbrook (southern part), Kimberly, and communities of Wycliffe and Marysville	Lateral crosses an Environmentally Sensitive Area (ESA), as mapped in the Cranbrook OCP (City of Cranbrook 2006), and Environmental Protection Development Permit area in Kimberly (City of Kimberly 2017)	269.0	50	**4:** 70.8 **5:** 185.2 **6:** 10.6 **No Data:** 2.5

3.4.2 Contaminated Sites

Details of the four APECs identified through the desktop assessment along KBY LTL 168 are provided in **Table 3.30**. Of the identified APECs, three are high risk and the remaining APEC is medium risk.

Table 3.30 Summary of Areas of Potential Environmental Concern for KBY LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
KBY LTL 168 (ILI)							
Y1/Z1	Kootenay Wood Preservers (4201 Echo Field Road, Cranbrook)	Total chlorinated phenols, metals	Aerial Imagery	On-Site	High	390	KO-043
Z2	Firing Range - Kimberley Trap and Skeet Club (9712 Highway 3/95, between Cranbrook and Kimberley)	Metals	Aerial Imagery	On-Site	High	310	KO-037
Z3	Former Kimberley municipal landfill and current municipal transfer station (Fertilizer Road, Kimberley)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Eris Ecolog (EM)	On-Site	High	580	KO-032 and KO-033
Z4	Former Cominco fertilizer mine and operations (400 - 312th Avenue, Kimberley)	Nitrate, chloride, sulphur, metals	Site Reg (Site ID 3319)	Adjacent	Medium	1275	KO-032

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

3.4.3 Fish and Fish Habitat

Twelve FWA mapped watercourses were identified within the KBY LTL 168 study area during desktop analysis. During PFR activities, eight of these watercourses were observed to have no identifiable stream channel. Three watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they were conservatively included as having potential to interact with gas main upgrade activities. A total of four watercourses potentially require riparian setbacks, depending on selected upgrade option and construction footprint. One watercourse is within the City of Kimberly (KO_KBY LTL 168_001), which requires a Development Permit within an environmental protection area and may require an Environmental Impact Study (**Section 4.5.5**). The remaining three watercourses require RMA setbacks calculated as per FRPA.

Waterbodies are summarized in **Table 3.31** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with high potential and one with medium potential to occur within the study area (**Table 3.32**). These species do not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.31 Summary of Waterbodies within the KBY LTL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_KBY LTL 168_001	Stream - intermittent	0	No	Yes	UKN	UKN	KO-033
KO_KBY LTL 168_002	NSCI	0	No	Yes	N/A	N/A	KO-033
KO_KBY LTL 168_003	NSCI	0	No	Yes	N/A	N/A	KO-033
KO_KBY LTL 168_004	NSCI	0	No	Yes	N/A	N/A	KO-034
KO_KBY LTL 168_005	NSCI	0	No	Yes	N/A	N/A	KO-034
KO_KBY LTL 168_006 (Luke Creek)	NSCI	0	No	Yes	N/A	N/A	KO-036
KO_KBY LTL 168_007 (Burnett Creek)	NSCI	0	No	Yes	N/A	N/A	KO-036
KO_KBY LTL 168_008 (St. Mary River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-038
KO_KBY LTL 168_009	NSCI	0	No	Yes	N/A	N/A	KO-039
KO_KBY LTL 168_010	UKN	0	UKN	Yes	UKN	UKN	KO-042
KO_KBY LTL 168_011	UKN	45	UKN	Yes	UKN	UKN	KO-042
KO_KBY LTL 168_012	NSCI	0	No	Yes	N/A	N/A	KO-043

0 = crosses alignment; NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.32 Fish Species of Concern with Medium or High Potential to Occur in the KBY LTL 16 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.4.4 Vegetation

The KBY LTL 168 study area is located within the IDFdm and Ponderosa PPdh subzones (G. D. Hope, Mitchell, et al. 1991, Hope et al. 1991). South of St. Mary River the study area is primarily composed of dense to open-canopy coniferous forest. This forested area ranges from age class 3 to 8 (DataBC, 2018), and is dominated by Douglas-fir, western larch, ponderosa pine and lodgepole pine, with some early seral western hemlock along the RoW. North of St. Mary River, the study area includes areas of non-forested fields and grasslands, as well as areas of sparse deciduous, mixed, and coniferous forest dominated by trembling aspen, western larch and ponderosa pine. No legal OGMAs or areas of old growth (i.e., age class 9) forest were identified within the study area.

Approximately 7,470 m² of invasive vegetation (comprised of 11 species and distributed over 27 sites) were identified in the study area during the desktop search. An additional 29 sites of invasive vegetation were identified during the PFR (**Table 3.33**).

Table 3.33 Invasive Vegetation Identified within the KBY LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hoary cress	*Cardaria draba*	HC	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Leafy spurge	*Euphorbia esula*	LS	Noxious (Provincially)
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		11
	Number of Sites		56
	Total Area (m^2)		7,470

Desktop studies identified one plant species of concern (alkaline wing-nerved moss) with high potential to occur within the study area (**Table 3.34**). Additionally, six provincially red or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.34** and **Table 3.35**). No other plant species have mapped CDC occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Thirty-one at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.34**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.34 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the KBY LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Vascular Plants						
Dainty moonwort	*Botrychium crenulatum*	-	-	Blue	-	Medium
Hairstem groundsmoke	*Gayophytum ramosissimum*	-	-	Red	-	Medium
Prairie gentian	*Gentiana affinis*	-	-	Red	-	Medium
Prairie golden bean	*Thermopsis rhombifolia*	-	-	Red	-	Medium
Scarlet gaura	*Oenothera suffrutescens*	-	-	Red	-	Medium
Spurless touch-me-not	*Impatiens ecornuta*	-	-	Red	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Rough fescue - (Idaho fescue) - yarrow - clad lichens	*Festuca campestris - (Festuca idahoensis) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Hybrid white spruce - trembling aspen / wild sarsaparilla	*Picea engelmannii x glauca - Populus tremuloides / Aralia nudicaulis*	-	-	Red	Yes	X
Ponderosa pine - trembling aspen / prairie rose	*Pinus ponderosa - Populus tremuloides / Rosa woodsii*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass - silky lupine	*Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus*	-	-	Red	Yes	X
Ponderosa pine / common snowberry / bluegrasses	*Pinus ponderosa / Symphoricarpos albus / Poa* spp.	-	-	Red	Yes	X
Trembling aspen - black cottonwood / common snowberry / common horsetail	*Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense*	-	-	Red	Yes	X
Black cottonwood / red-osier dogwood - Nootka rose	*Populus trichocarpa / Cornus stolonifera - Rosa nutkana*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	-	-	Blue	Yes	X
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / mallow ninebark	*Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry / arrowleaf balsamroot	*Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / prairie sandgrass - needle-and-thread grass / sidewalk screw-moss	*Purshia tridentata / Calamovilfa longifolia - Hesperostripa comata / Syntrichia ruralis*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X
Compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	*Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.

"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.35 Plants of Concern with Mapped CDC Occurrences in the KBY LTL 168 Study Area

English Name	Mapped CDC occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Dainty moonwort	Overlaps	156,955	This is a general historic observation from Cranbrook from 1943 and overlaps the southern tip of the study area (approximately 600 m of the lateral)
Hairstem groundsmoke	Overlaps	3,803,901	This is a general historic observation from Marysville from 1958, and overlaps the study area from approximate chainage 1+5 to its north end
Prairie gentian	Overlaps	299,895	This is a historic observation from 1964 from Marysville and overlaps the study are from approximate chainage 17+7 to 19+7
Prairie golden bean	Overlaps	2,670,207	This is a general historic observation from 1964 from Marysville, and overlaps the study area from approximate chainage 7+2 to its north end
Scarlet gaura	Overlaps	2,670,207	This is a general historic observation from 1964 from Marysville, and overlaps the study area from approximate chainage 7+2 to its north end
Spurless touch-me-not	Overlaps	3,179,962	Two occurrences, both from 1980. The larger occurrence overlaps the smaller, and overlaps the study area from approximate chainages 7+2 to its north end

3.4.5 Wildlife

The KBY LTL 168 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WHAs or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006) for Elk, bighorn sheep, moose, mule deer, and white-tailed deer (DataBC, 2018). During PFR, field crews located an American badger (*Taxidea taxus)* den, immediately adjacent to the lateral on the RoW (**W001, KO-037**). The den appeared to be a recently active overnight den. No other observations of wildlife of concern or wildlife habitat features were recorded during PFR.

Wildlife habitat within the study area varies and includes areas of dense to open-canopy coniferous forest, mixed and deciduous forests, non-forested fields and grasslands, and riparian areas. The variety of habitat present may provide migration corridors (for migration and dispersal), foraging habitat, security and thermal habitat, and areas for nesting, breeding and denning. The habitat present is suitable for a variety of wildlife, including species of wildlife of concern.

Desktop studies identified 24 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.36**). Three of these species have mapped CDC occurrences within the study area, though one of these species, sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), is now believed to be extirpated from the area. Two of the wildlife species of concern identified have federally-designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.37**). Desktop studies did not identify any mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.36 Wildlife of Concern with Medium or High Potential to Occur in the KBY LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Great Blue Heron, herodias subspecies	*Ardea herodias herodias*	1-WA	-	Blue	Yes	Yes	Medium
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Long-billed Curlew	*Numenius americanus*	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Williamson's Sapsucker	*Sphyrapicus thyroideus*	1-E (Aug 2006)	E (Dec 2017)	Blue	Yes	-	Medium

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	Medium
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.37 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the KBY LTL 168 Study Area

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlap	20,998,189	Occurrence overlaps with much of the East Kootenay Trench, which encompasses observations of 1,395 American badgers from 1945 to 2010. This occurrence overlaps with the entire the study area	-	-	-
Caribou	-	-	-	Overlaps	21,030,064	Mapped polygon overlaps with entire study area, which is located along eastern portion of critical habitat and extends north to Canal flats and the Canada/USA border to the south Lateral overlaps low elevations of the polygon where specific features that are considered critical habitat include: forests of cedar, hemlock and spruce; avalanche chutes, burns, and mineral licks (EC 2014)

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Lewis's Woodpecker	2 occurrences, closest is 244	53,825	Occurrence consists of three sites, two of which overlap with the study area near chainages 13+4 (southwest of lateral) and 15+0 (northeast of lateral). Last confirmed observation was in 2005 (one adult)	Overlaps	3,862,931	Numerous parcels of proposed critical habitat exist near the center of the lateral (approximate chainages 5+3 15+0) Within parcels, critical habitat is identified where known and potential nesting trees exist (alive, standing or dead), plus a 400 m buffer around where key foraging habitat attributes (standing trees not exceeding 35% canopy closure and presence of fruit-bearing shrubs and perennial grasses) are present (ECCC, 2017)
Sharp-tailed Grouse, *Columbianus* Subspecies	459	11,781	Historic observation (1989) in northeast section of study area. Nearest location to lateral is approximate chainage 10+1	-	-	-

3.5 CRK LP2 219

The CRK LP2 219 is 4.0 km long and is in a general southeast to northwest direction, northwest of Cranbrook. The south end of the lateral is located at the McPhee Road Control Station and the north end is located at the Six-Mile Road-Valve Assembly Station. The northern-most approximately 2.3 km of CRK LP2 is located immediately parallel to KBY LTL 168 (**Figures KO-041** to **KO-044**). CRK LP2 219 was assessed on June 6, 2018 by UTV.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.5.1** to **3.5.5**.

3.5.1 Land Use

The southern approximately 1.4 km of CRK LP2 is in an unforested industrial area. From approximate chainage 10+7 to its north end, the lateral is aligned through a forested and rural area. A summary of the land use within the study area is provided in **Table 3.38**.

Table 3.38 Overview of Land Use within the CRK LP2 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Provincial: 11.9 **Municipal**: 3.9 **Private**: 53.0 **None**: 11.5	East Kootenay	Cranbrook	Lateral crosses an Environmentally Sensitive Area (ESA), as mapped in the Cranbrook (City of Cranbrook 2006)	14.1	6	**5:** 10.8 **6:** 3.3

3.5.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along CRK LP2 219 are provided in **Table 3.39**.

Table 3.39 Summary of Areas of Potential Environmental Concern for CRK LP2 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CRK LP2 219 (ILI)							
Y1/Z1	Kootenay Wood Preservers (4201 Echo Field Road, Cranbrook)	Total chlorinated phenols, metals	Aerial Imagery	Adjacent	Medium	90	KO-043
Y2	Industrial Landfill - Bildfell Industrial Landfill Site (4100 Playle Road, Cranbrook)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	Site Reg (Site ID 5316)	200 m south	Low	110	KO-043

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

3.5.3 Fish and Fish Habitat

Four FWA mapped watercourses were identified within the CRK LP2 219 study area during desktop analysis. During PFR activities, 2 FWA mapped watercourses were observed to have no identifiable stream channel. Two watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they are conservatively being included as having potential to interact with gas main upgrade activities. A total of 2 watercourses potentially require riparian setbacks (calculated as per FRPA), depending on selected upgrade option and construction footprint.

Waterbodies are summarized in **Table 3.40** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with medium potential to occur within the study area (**Table 3.41**). This species does not have any known occurrences or federally-designated critical habitat within the study area (DataBC 2018).

Table 3.40 Summary of Waterbodies within the CRK LP2 219 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO__CRK LP2 219_001	NSCI	0	No	Yes	N/A	N/A	KO-043
KO_KBY LTL 168_010	UKN	0	UKN	Yes	UKN	UKN	KO-042
KO_KBY LTL 168_011	UKN	45	UKN	Yes	UKN	UKN	KO-042
KO_KBY LTL 168_012	NSCI	0	No	Yes	N/A	N/A	KO-043

0 = crosses alignment; NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.41 Wildlife of Concern with Medium or High Potential to Occur in the CRK LP2 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.5.4 Vegetation

The CRK LP2 219 study area is located within IDFdm subzone (G. D. Hope, Mitchell, et al. 1991). Vegetation within the study area consists mostly of dense stands of mature (age classes 5 to 8) coniferous forest, dominated by Douglas-fir, western larch, and ponderosa and lodgepole pine, with some early seral western hemlock along the RoW (DataBC 2018). The southern portion of the study area also crosses an unforested grassy area. No legal OGMAs or areas of old growth forest (i.e., age class 9) were identified within the study area.

Approximately 28 m² of invasive vegetation (comprised of seven species and distributed over six sites) were identified in the study area during the desktop search. An additional two sites of invasive vegetation were identified during the PFR (**Table 3.42**).

Table 3.42 Invasive Vegetation Identified within the CRK LP2 219 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Leafy spurge	*Euphorbia esula*	LS	Noxious (Provincially)
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		7
	Number of Sites		8
	Total Area (m^2)		28

Desktop studies identified one plant species of concern (alkaline wing-nerved moss) with high potential to occur within the study area (**Table 3.43**). Additionally, two provincially red- or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.43** and **Table 3.44**). No other plant species have mapped CDC occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Twenty-one at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.43**); although, none of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.43 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CRK LP2 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Dainty moonwort	*Botrychium crenulatum*	-	-	Blue	-	Medium
Hairstem groundsmoke	*Gayophytum ramosissimum*	-	-	Red	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Hybrid white spruce - trembling aspen / wild sarsaparilla	*Picea engelmannii x glauca - Populus tremuloides / Aralia nudicaulis*	-	-	Red	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	-	-	Blue	Yes	X
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry / arrowleaf balsamroot	*Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata*	-	-	Red	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.44 Plants of Concern with Mapped CDC Occurrences in the CRK LP2 219 Study Area

English Name	Mapped CDC occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Dainty moonwort	Overlaps	97,842	This is a general historic observation from Cranbrook from 1943 and overlaps the southern tip of the study area (approximately 300 m of the lateral)
Hairstem groundsmoke	Overlaps	484,279	This is a general historic observation from Marysville from 1958, and overlaps the study area from approximate chainage 11+2 to its north end

3.5.5 Wildlife

The CRK LP2 219 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WHAs or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006). Elk, bighorn sheep, mule deer, and white-tailed deer are the primary management species within the study area (DataBC, 2018). No observations of wildlife of concern or wildlife habitat features were recorded during the PFR.

Wildlife habitat present within the study area consists mostly of mature (i.e., age classes 5 to 8) coniferous forest, and includes areas of unforested or sparsely forested fields grasslands int the southern end. This habitat may provide foraging, nesting, security and thermal habitat for a variety of wildlife, including species of concern.

Desktop studies identified 22 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.45**). One of these species have mapped CDC occurrences within the study area and one has federally-designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.46**). Desktop studies did not identify any mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.45 Wildlife of Concern with Medium or High Potential to Occur in the CRK LP2 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Long-billed Curlew	*Numenius americanus*	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow		-	High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	Medium

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	Medium
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.46 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the CRK LP2 219 Study Area

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	4,715,897	Occurrence overlaps with much of the East Kootenay Trench, which encompasses observations of 1,395 American badgers from 1945 to 2010. This occurrence overlaps with the entire the study area	-	-	-
Caribou	-	-	-	Overlaps	4,715,897	Mapped polygon overlaps with entire study area, which is along the eastern portion of the critical habitat (extends north to Canal flats and the Canada/USA border to the south) Lateral overlaps low elevations of the polygon, where specific features that are considered critical habitat include: forests of cedar, hemlock and spruce; avalanche chutes, burns, and mineral licks (ECCC, 2014)

3.6 CRK LOP 273

CRK LOP 273 is 9.4 km long and is oriented in a general southeast to northwest direction though the Cranbrook, BC. At its southeast end, the lateral is connected to CRK LTL 168 and CRK LOP 219 at, Cranbrook Gate Station, and at its northwest end, it ties into KBY LTL 168 and CRK LOP 219 at McPhee Road Control Station. On June 6, 2018 the CRK LP2 219 lateral was assessed using a UTV.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.6.1** to **3.6.5**.

3.6.1 Land Use

The southern end CRK LOP 273 is located within an urban area south of Cranbrook and passes through several different private properties. From here, the lateral aligned northward through Cranbrook Community Forest, and then runs northeastward, crossing Highway 3, CPR tracks, and two golf courses. The majority of CRK LOP 273 is within ALR land, with some parts passing through private and crown land (**Table 3.47**).

Table 3.47 Overview of Land Use within the CRK LOP 273 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Provincial: 54.0 **Municipal**: 11.6 **Private**: 76.4 **None**: 37.0 **Unknown**: 1.2 **Mixed Ownership:** 0.3	East Kootenay	Cranbrook	Lateral crosses the southwestern part of Cranbrook Community Forest, which has trails used for walking, hiking, biking, horseback riding, and skiing. Lateral is adjacent to Idlewild Park in Cranbrook, a municipal park with walking trails North of Cranbrook, the lateral also crosses Wildstone and Mission Hills golf courses. Lateral crosses an Environmentally Sensitive Area (ESA), as mapped in the Cranbrook Official Community Plan (City of Cranbrook 2006)	88.8	27	**4:** 36.2 **5:** 49.6 **6:** 3.0

3.6.2 Contaminated Sites

Details of the single APEC identified through the desktop assessment along CRK LOP 273 is provided in **Table 3.48**. The APEC is a railway crossing and is medium risk.

Table 3.48 Summary of Areas of Potential Environmental Concern for CRK LOP 273

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CRK LOP 273 (ILI)							
X1	Railway Crossing (south of intersection of Highway 95A and Theatre Road, Cranbrook)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-044

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
VPH – Volatile Petroleum Hydrocarbons

3.6.3 Fish and Fish Habitat

Ten FWA mapped watercourses were identified within the CRK LOP 273 study area during desktop analysis. During PFR activities, five of these watercourses were observed to have no identifiable stream channel. Two watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they were conservatively included as having potential to interact with gas main upgrade activities. Joseph Creek crosses the alignment twice. Each crossing was assigned its own unique ID (KO_CRK LOP 273_003 and 010). A total of seven watercourses potentially require riparian setbacks, depending on selected upgrade option and construction footprint.

One watercourse is within the City of Cranbrook (KO_CRK LOP 273_003), which requires an Environmentally Sensitive Area Development Permit within Environmentally Sensitive Areas. Riparian setbacks may be up to 45 m, as determined by an Environmental Impact Study (**Section 4.5.4**). The remaining six watercourses require RMA setbacks calculated as per FRPA.

Waterbodies are summarized in **Table 3.49** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with medium potential to occur within the study area (**Table 3.50**). This species does not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.49 Summary of Waterbodies within the CRK LOP 273 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CRK LOP 273_001	NSCI	0	No	Yes	N/A	N/A	KO-044
KO_CRK LOP 273_002	NSCI	0	No	Yes	N/A	N/A	KO-045
KO_CRK LOP 273_003 (Joseph Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-045
KO_CRK LOP 273_004	UKN	50	UKN	Yes	UKN	UKN	KO-045
KO_CRK LOP 273_005	NSCI	0	No	Yes	N/A	N/A	KO-046
KO_CRK LOP 273_006	UKN	40	UKN	Yes	UKN	UKN	KO-047
KO_CRK LOP 273_007	NSCI	0	No	Yes	N/A	N/A	KO-047
KO_CRK LOP 273_008	Wetland	10	UKN	Yes	W2	30	KO-048
KO_CRK LOP 273_009	NSCI	0	No	Yes	N/A	N/A	KO-048
KO_CRK LOP 273_010 (Joseph Creek)	Stream - permanent	0	Yes	yes	S3	40	KO-049

0 = crosses alignment; NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.50 Fish Species of Concern with Medium or High Potential to Occur in the CRK LOP 273 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.6.4 Vegetation

The CRK LOP 273 study area is located within the transition zone between Ponderosa Pine Dry Hot (PPdh) and IDFdm and subzones, with most of the lateral falling within the IDFdm subzone. The IDFdm subzone occurs in low-to mid elevations in southeastern BC, and the PPdh subzone occurs along dry valleys within the southern Interior Plateau of BC (G. D. Hope, Mitchell, et al. 1991, Hope et al. 1991). Common climax species for these zones include Douglas-fir, western larch, and ponderosa pine (G. D. Hope, Mitchell, et al. 1991, Hope et al. 1991). Vegetation within the study area includes areas of dense coniferous forest dominated by Douglas-fir and ponderosa pine in the Cranbrook Community Forest, areas of grassland with sparse forest canopy, and mowed grass associated with the Wildstone and Mission Hills golf courses. No legal OGMAs or areas of old growth forest (i.e., age class 9) were identified within the study area.

Approximately 75 m² of invasive vegetation (comprised of 11 species and distributed over 24 sites) were identified in the study area during the desktop search. An additional five sites of invasive vegetation were identified during the PFR (**Table 3.51**).

Table 3.51 Invasive Vegetation Identified within the CRK LOP 273 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Burdock species	*Arctium spp*	BU	Noxious (Regionally)
Baby's breath	*Gypsophila paniculata*	BY	Invasive
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hoary cress	*Cardaria draba*	HC	Noxious (Regionally)
Leafy spurge	*Euphorbia esula*	LS	Noxious (Provincially)
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
St. John's wort/Saint John's wort/ Goatweed	*Hypericum perforatum*	SJ	Invasive
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		11
	Number of Sites		29
	Total Area (m^2)		75

Desktop studies identified one plant species of concern with high potential to occur within the study area (**Table 3.52**). Additionally, two provincially red- or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.52** and **Table 3.53**). No other plant species of concern have mapped CDC occurrences within the study area. Whitebark pine was identified to have federally-designated critical habitat polygons that overlaps the study area (DataBC 2018); however, this species is considered to have low potential to occur, as it is typically found at higher elevations (i.e., montane to sub-alpine) (ECCC 2017*a*). Thirty-one at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.52**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.52 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CRK LOP 273 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Dainty moonwort	*Botrychium crenulatum*	-	-	Blue	-	Medium
Scarlet gaura	*Oenothera suffrutescens*	-	-	Red	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Rough fescue - (Idaho fescue) - yarrow - clad lichens	*Festuca campestris - (Festuca idahoensis) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia spp.*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Hybrid white spruce - trembling aspen / wild sarsaparilla	*Picea engelmannii x glauca - Populus tremuloides / Aralia nudicaulis*	-	-	Red	Yes	X
Ponderosa pine - trembling aspen / prairie rose	*Pinus ponderosa - Populus tremuloides / Rosa woodsii*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass - silky lupine	*Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Ponderosa pine / common snowberry / bluegrasses	*Pinus ponderosa / Symphoricarpos albus / Poa* spp.	-	-	Red	Yes	X
Trembling aspen - black cottonwood / common snowberry / common horsetail	*Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense*	-	-	Red	Yes	X
Black cottonwood / red-osier dogwood - Nootka rose	*Populus trichocarpa / Cornus stolonifera - Rosa nutkana*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	-	-	Blue	Yes	X
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / mallow ninebark	*Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry / arrowleaf balsamroot	*Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata*	-	-	Red	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / prairie sandgrass - needle-and-thread grass / sidewalk screw-moss	*Purshia tridentata / Calamovilfa longifolia - Hesperostripa comata / Syntrichia ruralis*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	*Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.53 Plants of Concern with Mapped CDC Occurrences in the CRK LOP 273 Study Area

English Name	Mapped CDC occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Dainty moonwort	Overlaps	1,904,755	This is a general historic observation from Cranbrook from 1943 and overlaps the entire study area
Scarlet gaura	Overlaps	268,464	This is a general observation from 1989 and overlaps approximately 1.4 km of the study area at the south end

3.6.5 Wildlife

The CRK LOP 273 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WHAs or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006) for elk, bighorn sheep, moose, mule deer, and white-tailed deer (DataBC, 2018). No observations of wildlife of concern or wildlife habitat features were recorded during the PFR.

Wildlife habitat within the study area includes cleared fields, areas of sparsely forested grassland habitat, dense coniferous forest (associated with the Cranbrook Community Forest), and riparian areas. These habitats may provide foraging, security and thermal habitat, as well as sites for nesting and breeding for variety of wildlife, including species of concern.

Desktop studies identified 16 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.54**). Two of these species have mapped CDC occurrences within the study area and one has federally-designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.55**). Desktop studies did not identify any mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.54 Wildlife of Concern with Medium or High Potential to Occur in the CRK LOP 273 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	Medium
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow		Yes	High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	Medium
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	Medium
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.55 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the CRK LOP 273 Study Area

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlap	9,956,485	Occurrence overlaps with much of the East Kootenay Trench, which encompasses observations of 1,395 American badgers from 1945 to 2010. This occurrence overlaps with the entire the study area	-	-	-
Caribou	-	-	-	Overlap	2,786,800	Mapped polygon overlaps with northwestern part of study area, beginning around chainage 7+0. Study area is along eastern portion of critical habitat, which extends north to Canal Flats and the Canada/USA border to the south Lateral overlaps low elevations of the polygon, where specific features that are considered critical habitat include: forests of cedar, hemlock and spruce; avalanche chutes, burns, and mineral licks (ECCC, 2014)
Painted Turtle - Intermountain - Rocky Mountain Population	344	28,008	Two western painted turtles were observed in 2006, on the south side of the lateral, near chainage 7+2	-	-	-

3.7 CRK LTL 168

The CRK LTL 168 alignment is 34.0 km long, located southeast of Cranbrook, BC. From its southern end at the Gold Creek Odorant Station, the alignment of the lateral roughly parallels Gold Creek Road in a northwest direction and terminates in an urban area just south of Cranbrook where it ties into CRK LOP 273 at the Cranbrook Gate Station (**Figures KO-049** to **KO-069**).

On June 5, 6, and 7, 2018 the lateral was assessed on foot, by truck, and by UTV. Access issues were frequent due to fencing on private land and urban areas throughout the City of Cranbrook.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.7.1 to 3.7.5**.

3.7.1 Land Use

The majority of the CRK LTL 168 was located in largely undeveloped forested area. The lateral is aligned along the southwest side of Philips Reservoir near approximate chainages 28+5 to 29+4. The northern-most 4 km of the lateral just south of Cranbrook is within an urban area with several different private property owners. A large portion of the CRK LTL 168 is within agricultural land (approximately 27 km), though much of this area does not appear to be used currently for agricultural purposes. A summary of the land use within the study area is provided in **Table 3.56**.

Table 3.56 Overview of Land Use within the CRK LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Crown Provincial: 15.6 **Municipal**: 75.9 **Private**: 111.7 **None**: 245.1	East Kootenay	N/A	-	446.9	52	**4:** 63.3 **5:** 307.5 **6:** 75.2 **7:** 0.9

3.7.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along CRK LTL 168 are provided in **Table 3.57**. No APECs were identified along CRK LTL 168.

Table 3.57 Summary of Areas of Potential Environmental Concern for CRK LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CRK LTL 168 (ILI)							
No APECs identified							

Notes: APEC – Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

3.7.3 Fish and Fish Habitat

Thirty-five FWA mapped watercourses were identified within the CRK LTL 168 study area during desktop analysis. During PFR activities, 19 FWA mapped watercourses were observed to have no identifiable stream channel, and an additional four unmapped waterbodies were observed and subsequently mapped. Four watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they were conservatively included as having potential to interact with gas main upgrade activities. Gold Creek crosses the alignment six times. Each crossing was assigned its own unique ID (KO_CRK LTL 18_013, 014, 019, 028, 030-US, and 030-DS). A total of 20 watercourses potentially require riparian setbacks (RMA setbacks calculated as per FRPA), depending on selected upgrade option and construction footprint.

Waterbodies are summarized in **Table 3.58** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with high potential to occur within the study area and one fish species of concern with medium potential to occur within the study area (**Table 3.59**). These species do not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.58 Summary of Waterbodies within the CRK LTL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
CRK LOP 273_010 (Joseph Creek)	Stream - permanent	35	Yes	Yes	UKN	UKN	KO-049
KO_CRK LTL 168_001	NSCI	0	No	Yes	N/A	N/A	KO-049
KO_CRK LTL 168_002	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-050
KO_CRK LTL 168_003 (Joseph Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-053
KO_CRK LTL 168_004	Stream - permanent	90	Yes	Yes	UKN	UKN	KO-053
KO_CRK LTL 168_005	NSCI	0	UKN	Yes	N/A	N/A	KO-054
KO_CRK LTL 168_006	NSCI	0	UKN	Yes	N/A	N/A	KO-054
KO_CRK LTL 168_007	NSCI	0	UKN	Yes	N/A	N/A	KO-055
KO_CRK LTL 168_008	NSCI	0	UKN	Yes	N/A	N/A	KO-055
KO_CRK LTL 168_009	NSCI	0	UKN	Yes	N/A	N/A	KO-055

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CRK LTL 168_010	NSCI	0	No	Yes	N/A	N/A	KO-056
KO_CRK LTL 168_011	NSCI	0	No	Yes	N/A	N/A	KO-057
KO_CRK LTL 168_012	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-058
KO_CRK LTL 168_013 (Gold Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-058
KO_CRK LTL 168_014 (Gold Creek)	Stream - permanent	0	UKN	Yes	S3	40	KO-059
KO_CRK LTL 168_015	NSCI	0	UKN	Yes	N/A	N/A	KO-059
KO_CRK LTL 168_016	NSCI	0	UKN	Yes	N/A	N/A	KO-059
KO_CRK LTL 168_017	Stream - intermittent	0	UKN	Yes	S4	30	KO-060
KO_CRK LTL 168_018	NSCI	0	No	Yes	N/A	N/A	KO-061
KO_CRK LTL 168_019 (Gold Creek)	Stream - permanent	65	Yes	Yes	S3	40	KO-061
KO_CRK LTL 168_020	Stream - permanent	0	UKN	Yes	S4	30	KO-062
KO_CRK LTL 168_021	NSCI	0	UKN	Yes	N/A	N/A	KO-062
KO_CRK LTL 168_022	Stream - permanent	0	UKN	Yes	S4	30	KO-064
KO_CRK LTL 168_023	NCD	0	UKN	Yes	N/A	N/A	KO-064
KO_CRK LTL 168_024	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_025	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_026	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_027	NSCI	0	No	Yes	N/A	N/A	KO-066
KO_CRK LTL 168_028 (Gold Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-066

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CRK LTL 168_029	NSCI	0	No	Yes	N/A	N/A	KO-067
KO_CRK LTL 168_030-US (Gold Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-067
KO_CRK LTL 168_030-DS (Gold Creek)	Stream - permanent	40	Yes	Yes	S3	40	KO-069
KO_CRK LTL 168_031	Stream - permanent	0	UKN	Yes	S4	30	KO-068
KO_CRK LTL 168_032	NSCI	0	No	Yes	N/A	N/A	KO-069
KO_CRK LTL 168_033	NSCI	0	No	Yes	N/A	N/A	KO-069
KO_CRK LTL 168_034	NSCI	0	No	Yes	N/A	N/A	KO-069
KO_CRK LTL 168_035	Lake	45	Yes	No	L1-B	10	KO-052
KO_CRK LTL 168_036	Wetland	12	UKN	No	W3	30	KO-059
KO_CRK LTL 168_037	NCD	0	UKN	No	N/A	N/A	KO-061
KO_CRK LTL 168_038	Stream - permanent	0	UKN	No	S3	40	KO-052

0 = crosses alignment; NCD = non-classified drainage; NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.59 Fish Species of Concern with Medium or High Potential to Occur in the CRK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC =special concern

3.7.4 Vegetation

The CRK LTL 168 study area is located within the transition zone between Interior Douglas Fir Dry Mild (IDFdm) subzone at lower elevations, and MSdk subzone at higher elevations. Both of these subzones occur in at low-to mid elevations in southeastern BC (G. D. Hope, Mitchell, et al. 1991, Hope et al. 1991). Common climax species for these zones include hybrid white spruce, subalpine fir, Douglas-fir, and western larch. Vegetation within the study area varies considerably. The southern portion of the lateral primarily consists of a continuous mature coniferous forest. The central portion contains a mosaic of recently cleared cutblocks, areas of open canopy or sparsely forested grasslands, and dense coniferous forest stands. The northern portion has areas of sparse forest associated with rural and residential areas. Forested areas present within the study area are generally dominated by coniferous species, including lodgepole pine, Douglas-fir, western larch, and Engelmann and white spruce. No legal OGMAs were identified within the study area during the desktop studies; however, stands of old growth forest (i.e., age class 8) are shown by the VRI, covering a total approximate area of 22 ha within the study area (DataBC, 2018).

Approximately 262 m² of invasive vegetation (comprised of 17 species and distributed over 81 sites) were identified in the study area during the desktop search. An additional 20 sites of invasive vegetation were identified during the PFR (**Table 3.60**).

Table 3.60 Invasive Vegetation Identified within the CRK LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Chicory	*Cichorium intybus*	CY	Invasive
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hawkweed species	*Hieracium spp*	HS	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Mullein	*Verbascum thapsis*	MU	Invasive
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
Scentless chamomile	*Matricaria perforata*	SH	Noxious (Provincially)
St. John's wort/ Goatweed	*Hypericum perforatum*	SJ	Invasive
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Yellow devil hawkweed	*Hieracium glomeratum*	YD	Invasive
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
	Number of Species		17
	Number of Sites		101
	Total Area (m^2)		262

Desktop studies identified two plant species of concern with medium or high potential to occur within the study area (**Table 3.61**). Additionally, two provincially red- or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.61** and **Table 3.62**). These two species do not meet the criteria for plant species of concern as defined in the methods section (**Section 2.0**); however, they are listed in this report as plant species of concern because of their known occurrence within the study area. No other plant species of concern have mapped CDC occurrences within the study area. Whitebark pine was identified to have federally-designated critical habitat polygons that overlaps the study area (ECCC 2017*a*) (**Table 3.62**). Twenty-four at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.61**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.61 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CRK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Dainty moonwort	*Botrychium crenulatum*	-	-	Blue	-	Medium
Scarlet gaura	*Oenothera suffrutescens*	-	-	Red	-	Medium
Whitebark pine	*Pinus albicaulis*	1-E (Jul 2012)	E (Apr 2010)	Blue	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Eriogonum umbellatum - Eremogone capillaris*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Pseudoroegneria spicata - Eriogonum umbellatum - Eremogone capillaris*	-	-	Blue	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Hybrid white spruce - trembling aspen / wild sarsaparilla	*Picea engelmannii x glauca - Populus tremuloides / Aralia nudicaulis*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	-	-	Blue	Yes	X
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry / arrowleaf balsamroot	*Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata*	-	-	Red	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Drummond's willow / bluejoint reedgrass	*Salix drummondiana / Calamagrostis canadensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.62 Plants of Concern with Mapped CDC occurrences or Critical Habitat in the CRK LTL 168 Study Area

English Name	Mapped CDC occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Dainty moonwort	Overlaps	677,493	This is a historic observation from Cranbrook from 1943 and overlaps the northernmost approximately 4.7 km of the lateral	-	-	-
Scarlet gaura	Overlaps	4,257,093	This is a general observation from 1989 and overlaps the northernmost approximately 22.4 km of the lateral	-	-	-
Whitebark pine	-	-	-	Overlaps	320,271	Study area overlaps with federally-proposed critical habitat polygon identified as the 2 km regeneration / recovery zone of a known population found on Baker Mountain. Within this area, critical habitat is identified as the following: Natural open parkland and forest openings that are greater than or equal to 0.5 ha in area, have suitable substrates for regeneration, and occur within the known regional elevation limits and the projected climate change envelope model limits Existing utility corridors are not identified as critical habitat (ECCC 2017*a*)

3.7.5 Wildlife

The CRK LTL 168 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006) for elk, bighorn sheep, moose, mule deer, and white-tailed deer (DataBC, 2018). The central portion of the study area (between approximate 20+8 and 28+7) is located within an approved WHA for grizzly bear (WHA 4-180). Field crews recorded a conspicuous stick nest in a coniferous tree located along the RoW, which appeared to be inactive at the time of the PFR (**W001**, **Figure KO-059**). No other observations of wildlife of concern or wildlife habitat features were recorded.

A variety of wildlife habitat is present within the study area, including areas continuous mature coniferous forest, cleared ROWs, cut blocks, areas of open canopy and sparsely forested grasslands, and riparian areas. Available habitat may provide migration corridors (for dispersal and migration), foraging, security and thermal habitat, and areas for nesting, denning and breeding for a variety of wildlife, including species of concern.

Desktop studies identified 20 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.63**). Two of these species have mapped CDC Occurrences within the study area (**Table 3.64**). None of these species have, have federally-designated critical habitat polygons within the study area (DataBC 2018). Similarly, no mapped masked (i.e., confidential) CDC occurrences occur within the study area (DataBC 2018).

Table 3.63 Wildlife of Concern with Medium or High Potential to Occur in the CRK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	High
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow			High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Williamson's Sapsucker	*Sphyrapicus thyroideus*	1-E (Aug 2006)	E (Dec 2017)	Blue	Yes	-	Medium
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	Medium
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.64 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the CRK LTL 168 Study Area

English Name	Mapped CDC Occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
American Badger	Overlap	17,029,114	Occurrence overlaps with much of the East Kootenay Trench, which encompasses observations of 1,395 American badgers from 1945 to 2010. Observations overlap with the southern extent of the study area (chainage 0+0 to 3+2), and near the middle of the lateral, from chainage 20+2, extending north to the end of the lateral (chainage 34+0)
Painted Turtle - Intermountain - Rocky Mountain Population	47	307,553	Two western painted turtles were observed in 2006, on the northeast side of the lateral (in Phillips Reservoir) from chainage 28+6 to 29+4. The lateral does not cross the reservoir

3.8 CRK LOP 219

CRK LOP 219 is also 34.0 km long and runs parallel to CRK LTL 168 over its entire length (**Figures KO-049** to **KO-06**). CRK LTL 219 was assessed on the same dates and using the same methods as those described for CRK LTL 168.

3.8.1 Land Use

As with CRK LTL 168, the majority of the CRK LOP 219 is in largely undeveloped forested area. The lateral is aligned along the southwest side of Philips Reservoir near approximate chainages 28+5 to 29+4. The northern-most 4 km of the lateral just south of Cranbrook, BC was within a dense, urban area with several different private property owners. A large portion of the existing CRK LTL 219 is aligned through agricultural land (approximately 27 km); although, much of this area does not appear to be currently used for agricultural purposes. A summary of the land use within the study area is provided in **Table 3.65**.

Table 3.65 Overview of Land Use within the CRK LOP 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Crown Provincial: 15.6 **Municipal**: 75.9 **Private**: 111.7 **None**: 245.1	East Kootenay	N/A	-	446.9	52	**4:** 63.3 **5:** 307.5 **6:** 75.2 **7:** 0.9

3.8.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along CRK LOP 219 are provided in **Table 3.66**. No APECs were identified along CRK LOP 219.

Table 3.66 Summary of Areas of Potential Environmental Concern for CRK LOP 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
CRK LOP 219 (ILI)							
No APECs identified							

Notes: APEC – Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

3.8.3 Fish and Fish Habitat

Thirty-five FWA mapped watercourses were identified within the CRK LOP 219 study area during desktop analysis. During PFR activities, 19 of these watercourses were observed to have no identifiable stream channel, and an additional four unmapped waterbodies were observed and subsequently mapped. Four watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they included as having potential to interact with gas main upgrade activities. Gold Creek crosses the alignment six times. Each crossing was assigned its own unique ID (KO_CRK LTL 18_013, 014, 019, 028, 030-US, and 030-DS). A total of 20 watercourses potentially require riparian setbacks (calculated as per FRPA), depending on selected upgrade option and construction footprint.

Waterbodies are summarized in **Table 3.67** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with high potential to occur within the study area and one fish species of concern with medium potential to occur within the study area (**Table 3.68**). These species do not have any known occurrences or federally-designated critical habitat within the study area (DataBC 2018).

Table 3.67 Summary of Waterbodies within the CRK LOP 219 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
CRK LOP 273_010 (Joseph Creek)	Stream - permanent	35	Yes	Yes	UKN	UKN	KO-049
KO_CRK LTL 168_001	NSCI	0	No	Yes	N/A	N/A	KO-049
KO_CRK LTL 168_002	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-050
KO_CRK LTL 168_003 (Joseph Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-053
KO_CRK LTL 168_004	Stream - permanent	90	Yes	Yes	UKN	UKN	KO-053
KO_CRK LTL 168_005	NSCI	0	UKN	Yes	N/A	N/A	KO-054
KO_CRK LTL 168_006	NSCI	0	UKN	Yes	N/A	N/A	KO-054
KO_CRK LTL 168_007	NSCI	0	UKN	Yes	N/A	N/A	KO-055
KO_CRK LTL 168_008	NSCI	0	UKN	Yes	N/A	N/A	KO-055
KO_CRK LTL 168_009	NSCI	0	UKN	Yes	N/A	N/A	KO-055
KO_CRK LTL 168_010	NSCI	0	No	Yes	N/A	N/A	KO-056
KO_CRK LTL 168_011	NSCI	0	No	Yes	N/A	N/A	KO-057
KO_CRK LTL 168_012	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-058
KO_CRK LTL 168_013 (Gold Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-058
KO_CRK LTL 168_014 (Gold Creek)	Stream - permanent	0	UKN	Yes	S3	40	KO-059
KO_CRK LTL 168_015	NSCI	0	UKN	Yes	N/A	N/A	KO-059
KO_CRK LTL 168_016	NSCI	0	UKN	Yes	N/A	N/A	KO-059

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CRK LTL 168_017	Stream - intermittent	0	UKN	Yes	S4	30	KO-060
KO_CRK LTL 168_018	NSCI	0	No	Yes	N/A	N/A	KO-061
KO_CRK LTL 168_019 (Gold Creek)	Stream - permanent	65	Yes	Yes	S3	40	KO-061
KO_CRK LTL 168_020	Stream - permanent	0	UKN	Yes	S4	30	KO-062
KO_CRK LTL 168_021	NSCI	0	UKN	Yes	N/A	N/A	KO-062
KO_CRK LTL 168_022	Stream - permanent	0	UKN	Yes	S4	30	KO-064
KO_CRK LTL 168_023	NCD	0	UKN	Yes	N/A	N/A	KO-064
KO_CRK LTL 168_024	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_025	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_026	NSCI	0	No	Yes	N/A	N/A	KO-065
KO_CRK LTL 168_027	NSCI	0	No	Yes	N/A	N/A	KO-066
KO_CRK LTL 168_030-US (Gold Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-067
KO_CRK LTL 168_030-DS (Gold Creek)	Stream - permanent	40	Yes	Yes	S3	40	KO-069
KO_CRK LTL 168_028 (Gold Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-066
KO_CRK LTL 168_029	NSCI	0	No	Yes	N/A	N/A	KO-067
KO_CRK LTL 168_031	Stream - permanent	0	UKN	Yes	S4	30	KO-068
KO_CRK LTL 168_032	NSCI	0	No	Yes	N/A	N/A	KO-069
KO_CRK LTL 168_033	NSCI	0	No	Yes	N/A	N/A	KO-069
KO_CRK LTL 168_034	NSCI	0	No	Yes	N/A	N/A	KO-069

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_CRK LTL 168_035	Lake	45	Yes	No	L1-B	10	KO-052
KO_CRK LTL 168_036	Wetland	12	UKN	No	W3	30	KO-059
KO_CRK LTL 168_037	NCD	0	UKN	No	N/A	N/A	KO-061
KO_CRK LTL 168_038	Stream - permanent	0	UKN	No	S3	40	KO-052

0 = crosses alignment; NCD = non-classified drainage; NSCI = no stream channel identified; N/A = not applicable; UKN = unknown

Table 3.68 Fish Species of Concern with Medium or High Potential to Occur in the CRK LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.8.4 Vegetation

As with the CRK LTL 168 study area, the CRK LOP 219 study area is located within the transition zone between IDFdm subzone at lower elevations, and MSdk subzone at higher elevations (G. D. Hope, Mitchell, et al. 1991, Hope et al. 1991). Vegetation within the study area varies considerably. The southern portion of the lateral includes continuous areas of mature coniferous forest. The central portion contains, a mosaic of recently cleared cutblocks, areas of open canopy or sparsely forested grasslands, and dense coniferous forest stands. The northern portion has areas of sparse forest associated with rural and residential areas. Forested areas present within the study area are dominated by coniferous species, including lodgepole pine, Douglas-fir, western larch, and Engelmann and white spruce. No legal OGMAs were identified within the study area during the desktop studies; however, stands of old growth forest (i.e., age class 8) are shown by the VRI, covering a total approximate area of 22 ha within the study area (DataBC, 2018).

Approximately 264 m² of invasive vegetation (comprised of 17 species and distributed over 82 sites) were identified in the study area during the desktop search. An additional 20 sites of invasive vegetation were identified during the PFR (**Table 3.69**).

Table 3.69 Invasive Vegetation Identified within the CRK LOP 219 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Chicory	*Cichorium intybus*	CY	Invasive
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hawkweed species	*Hieracium spp*	HS	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Mullein	*Verbascum thapsis*	MU	Invasive
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
Sulphur cinquefoil	*Potentilla recta*	SC	Noxious (Regionally)
Scentless chamomile	*Matricaria perforata*	SH	Noxious (Provincially)
St. John's wort/Saint John's wort/ Goatweed	*Hypericum perforatum*	SJ	Invasive
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Tall hawkweed	*Hieracium piloselloides*	TH	Invasive
Yellow devil hawkweed	*Hieracium glomeratum*	YD	Invasive
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
	Number of Species		27
	Number of Sites		102
	Total Area (m^2)		264

Desktop studies identified two plant species of concern with medium or high potential to occur within the study area (**Table 3.61**). Additionally, two provincially red- or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.61** and **Table 3.62**). No other plant species of concern have mapped CDC occurrences within the study area. Whitebark pine was identified to have federally-designated critical habitat polygons that overlaps the study area (ECCC 2017*a*) (**Table 3.62**). Twenty-four at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.61**); although, none of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.70 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the CRK LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Dainty moonwort	*Botrychium crenulatum*	-	-	Blue	-	Medium
Scarlet gaura	*Oenothera suffrutescens*	-	-	Red	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Scrub birch / horsetails	*Betula nana / Equisetum* spp.	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Swamp horsetail - beaked sedge	*Equisetum fluviatile - Carex utriculata*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Eriogonum umbellatum - Eremogone capillaris*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Pseudoroegneria spicata - Eriogonum umbellatum - Eremogone capillaris*	-	-	Blue	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Hybrid white spruce - trembling aspen / wild sarsaparilla	*Picea engelmannii x glauca - Populus tremuloides / Aralia nudicaulis*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - kinnikinnick	*Pseudotsuga menziesii / Calamagrostis rubescens - Arctostaphylos uva-ursi*	-	-	Blue	Yes	X
Douglas-fir / pinegrass - twinflower	*Pseudotsuga menziesii / Calamagrostis rubescens - Linnaea borealis*	-	-	Blue	Yes	X
Douglas-fir - western larch / pinegrass	*Pseudotsuga menziesii - Larix occidentalis / Calamagrostis rubescens*	-	-	Red	Yes	X
Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	*Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens*	-	-	Blue	Yes	X
Douglas-fir / common snowberry / arrowleaf balsamroot	*Pseudotsuga menziesii / Symphoricarpos albus / Balsamorhiza sagittata*	-	-	Red	Yes	X
Nuttall's alkaligrass - foxtail barley	*Puccinellia nuttalliana - Hordeum jubatum*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	X
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Drummond's willow / bluejoint reedgrass	*Salix drummondiana / Calamagrostis canadensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.

"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.71 Plants of Concern with Mapped CDC Occurrences or Critical Habitat in the CRK LOP 219 Study Area

English Name	Mapped CDC occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Dainty moonwort	Overlaps	677,493	This is a historic observation from Cranbrook from 1943 and overlaps approximately 4.7 km of the lateral at the north end	-	-	-
Scarlet gaura	Overlaps	4,257,093	This is a general observation from 1989 and overlaps the northernmost approximately 22.4 km of the lateral	-	-	-
Whitebark pine	-	-	-	Overlaps	317,926	Study area overlaps with federally-proposed critical habitat polygon identified as the 2 km regeneration / recovery zone of a known population found on Baker Mountain. Within this area, critical habitat is identified as the following: Natural open parkland and forest openings that are greater than or equal to 0.5 ha in area, have suitable substrates for regeneration, and occur within the known regional elevation limits and the projected climate change envelope model limits Existing utility corridors are not identified as critical habitat (ECCC 2017)

3.8.5 Wildlife

The CRK LTL 168 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006). Elk, moose, bighorn sheep, mule deer, and white-tailed deer are the primary management species within the study area (DataBC, 2018). The central portion of the study area (between approximate 20+8 and 28+7) is located within an approved WHA for grizzly bear (WHA 4-180). Field crews recorded a conspicuous stick nest in a coniferous tree located along the RoW (**W001**, **Figure KO-059**). No other observations of wildlife of concern or wildlife habitat features were recorded during PFR.

A variety of wildlife habitat is present within the study area, including areas of continuous, mature coniferous forest, cleared ROWs, cut blocks, areas of open canopy, sparsely forested grasslands, and riparian areas. Available habitat may provide migration corridors (for dispersal and migration), foraging, security and thermal habitat, and areas for nesting, denning and breeding for a variety of wildlife, including species of concern.

Desktop studies identified 20 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.72**). Two of these species have mapped CDC occurrences within the study area. None of these species have federally-designated critical habitat polygons within the study area (DataBC 2018). Similarly, no mapped masked (i.e., confidential) CDC occurrences occur within the study area (DataBC2018).

Table 3.72 Wildlife of Concern with Medium or High Potential to Occur in the CRK LOP 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	Medium
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	Medium
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	Medium
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow			High
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Blue	Yes	-	High
Williamson's Sapsucker	*Sphyrapicus thyroideus*	1-E (Aug 2006)	E (Dec 2017)	Blue	Yes	-	Medium
Amphibian							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	Medium
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.73 Wildlife of Concern with Mapped CDC Occurrences in the CRK LOP 219 Study Area

English Name	Mapped CDC Occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
American Badger	Overlap	17,024,750	Occurrence overlaps with much of the East Kootenay Trench, which encompasses observations of 1,395 American badgers from 1945 to 2010. Occurrence overlaps with the southern extent of the study area (chainage 0+0 to 3+2), then again near the middle of the lateral, from chainage 20+2, extending north to the end of the lateral (chainage 34+0)
Painted Turtle - Intermountain - Rocky Mountain Population	47	307,553	Two western painted turtles were observed in 2006, on the northeast side of the lateral (in Phillips Reservoir) from chainage 28+6 to 29+4. The lateral does not cross the reservoir

3.9 SSK LTL 219

SSK LTL 219 is 35.9 km long and starts at the Skookumchuck Gate Station where it branches off KBY LTL 168. From here, it is oriented in a general south to north orientation, ending at Skookumchuck Crossover Plant, just south of the Skookumchuck Pulp Mill (**Figures KO-070** to **KO-093**). The lateral was assessed on June 5 and 6, 2018 by UTV. Much of this existing lateral is aligned through ALR. Access was not a significant issue; however, access constraints were encountered near bend zone 4+923 where a tall deer fence and irrigation pipes blocked the RoW.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.9.1** to **3.9.5**.

3.9.1 Land Use

The majority of SKK LTL 219 is oriented through a mix of ALR and undeveloped forested areas. The lateral passes on the east side of the communities of Wycliffe and Tata Creek, and crosses Highway 95A and CPR tracks at approximate chainages 10+15, and 29+95, respectively.

Table 3.74 Overview of Land Use within the SSK LTL 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Lateral	Soil Agricultural Capability Classes (ha)
Crown Provincial: 62.1 **Private**: 142.0 **None**: 154.0	East Kootenay	Community of Wycliffe, Community of Tata Creek	-	714.7	35	**4:** 185.1 **5:** 484.9 **6:** 44.7

3.9.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along SSK LTL 219 are provided in **Table 3.75**. Both identified APECs are medium risk.

Table 3.75 Summary of Areas of Potential Environmental Concern for SSK LTL 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
SSK LTL 219 (ILI)							
AA1	Pulp Mill - Paper Excellence Skookumchuck Pulp Mill (Skookumchuck River Road, Skookumchuck)	BTEX/VPH, EPH, PAHs PCBs, chlorinated and non-chlorinated phenols, VOCs, metals	EM	100 m north and east	Medium	50	KO-070
AA2	Railway Crossing (west of Highway 95, south of Skookumchuck)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-073

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
EM – Environmental Monitoring Database
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

3.9.3 Fish and Fish Habitat

Nineteen FWA mapped watercourses were identified within the SSK LTL 168 study area during desktop analysis. During PFR activities, 13 of these watercourses were observed to have no identifiable stream channel. One watercourse was inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, it was conservatively included as having potential to interact with gas main upgrade activities. A total of six watercourses potentially require riparian setbacks (calculated as per FRPA), depending on selected upgrade option and construction footprint.

Waterbodies are summarized in **Table 3.76** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with medium potential to occur within the study area (**Table 3.77**). This species does not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.76 Summary of Waterbodies within the SSK LTL 219 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_SKK LTL 219_001	NSCI	0	No	Yes	N/A	N/A	KO-072
KO_SKK LTL 219_002	NSCI	0	No	Yes	N/A	N/A	KO-074
KO_SKK LTL 219_003	NSCI	0	No	Yes	N/A	N/A	KO-075
KO_SKK LTL 219_004	NSCI	0	No	Yes	N/A	N/A	KO-075, KO-76
KO_SKK LTL 219_005	NSCI	0	No	Yes	N/A	N/A	KO-079
KO_SKK LTL 219_006	Stream - permanent	0	Y	Yes	S2	50	KO-080
KO_SKK LTL 219_007 (Ta Ta Creek)	NSCI	0	No	Yes	N/A	N/A	KO-083
KO_SKK LTL 219_008	NSCI	0	No	Yes	N/A	N/A	KO-084
KO_SKK LTL 219_009	Wetland	10	UKN	Yes	W4	30	KO-085
KO_SKK LTL 219_010	NSCI	0	No	Yes	N/A	N/A	KO-085
KO_SKK LTL 219_011	NSCI	0	No	Yes	N/A	N/A	KO-086
KO_SKK LTL 219_012	Stream - permanent	0	Y	Yes	S2	50	KO-086
KO_SKK LTL 219_013	NSCI	0	No	Yes	N/A	N/A	KO-087
KO_SKK LTL 219_014	NCD	0	No	Yes	N/A	N/A	KO-088
KO_SKK LTL 219_015	NCD	0	No	Yes	N/A	N/A	KO-088 KO-089
KO_SKK LTL 219_016	NSCI	0	No	Yes	N/A	N/A	KO-089
KO_SKK LTL 219_017	Stream - intermittent	60	UKN	Yes	UKN	UKN	KO-090
KO_SKK LTL 219_018	NSCI	0	No	Yes	N/A	N/A	KO-092
KO_SKK LTL 219_019	NSCI	5	No	Yes	N/A	N/A	KO-093

NSCI = no stream channel identified; NCD= Non-classified drainage; N/A = not applicable; UKN - unknown

Table 3.77 Fish Species of Concern with Medium or High Potential to Occur in the SSK LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.9.4 Vegetation

The SSK LTL 219 study area is located within the PPdh subzone (G. D. Hope, Lloyd, et al. 1991). Vegetation within the study area includes areas of non-forested grassland and agricultural fields, and areas of sparse coniferous forest. Forested areas within the study area were generally dominated by ponderosa pine and Douglas fir that, range from age classes 2 to 8 (DataBC 2018). No legal OGMAs or areas of old growth forest (i.e., age class 9) were identified within the study area.

Approximately 84 m² of invasive vegetation (comprised of seven species and distributed over 27 sites) were identified in the study area during the desktop search. An additional 21 sites of invasive vegetation were identified during the PFR (**Table 3.78**).

Table 3.78 Invasive Vegetation Identified within the SSK LTL 219 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Dalmatian toadflax	*Linaria dalmatica*	DT	Noxious (Provincially)
Hawkweed species	*Hieracium spp*	HS	Noxious (Regionally)
Hound's-tongue	*Cynoglossum officinale*	HT	Noxious (Provincially)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
	Number of Species		7
	Number of Sites		27
	Total Area (m^2)		84

Desktop studies identified one plant species of concern (alkaline wing-nerved moss) with high potential to occur within the study area (**Table 3.79**). Additionally, four provincially red or blue-listed species are considered to have medium potential to occur within the study area based on mapped CDC occurrences (**Table 3.79** and **Table 3.80**). No other plant species have mapped CDC occurrences or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Nineteen at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.79**).A provincial WHA (4-117) for antelope-brush/bluebunch wheatgrass plant community is located on the west side of the study area, and overlaps the lateral at approximate chainage 28+9(DataBC 2018).

Table 3.79 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the SSK LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Hairstem groundsmoke	*Gayophytum ramosissimum*	-	-	Red	-	Medium
Prairie golden bean	*Thermopsis rhombifolia*	-	-	Red	-	Medium
Scarlet gaura	*Oenothera suffrutescens*	-	-	Red	-	Medium
Spurless touch-me-not	*Impatiens ecornuta*	-	-	Red	-	Medium
Nonvascular plants						
Alkaline wing-nerved moss	*Pterygoneurum kozlovii*	1-T (Aug 2006)	T (Nov 2004)	Blue	Yes	High
Ecological communities						
Alkali saltgrass Herbaceous Vegetation	*Distichlis spicata var. stricta* Herbaceous Vegetation	-	-	Blue	Yes	X
Rough fescue - (Idaho fescue) - yarrow - clad lichens	*Festuca campestris - (Festuca idahoensis) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - silky lupine - junegrass	*Festuca idahoensis - Pseudoroegneria spicata - Lupinus sericeus - Koeleria macrantha*	-	-	Red	Yes	X
Baltic rush - field sedge	*Juncus balticus - Carex praegracilis*	-	-	Red	Yes	X
Ponderosa pine - trembling aspen / prairie rose	*Pinus ponderosa - Populus tremuloides / Rosa woodsii*	-	-	Red	Yes	X
Ponderosa pine / bluebunch wheatgrass - silky lupine	*Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus*	-	-	Red	Yes	X
Ponderosa pine / common snowberry / bluegrasses	*Pinus ponderosa / Symphoricarpos albus / Poa* spp.	-	-	Red	Yes	X
Trembling aspen - black cottonwood / common snowberry / common horsetail	*Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense*	-	-	Red	Yes	X

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Black cottonwood / red-osier dogwood - Nootka rose	*Populus trichocarpa / Cornus stolonifera - Rosa nutkana*	-	-	Red	Yes	X
Bluebunch wheatgrass - arrowleaf balsamroot	*Pseudoroegneria spicata - Balsamorhiza sagittata*	-	-	Blue	Yes	X
Bluebunch wheatgrass - junegrass	*Pseudoroegneria spicata - Koeleria macrantha*	-	-	Blue	Yes	X
Douglas-fir - ponderosa pine / mallow ninebark	*Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus*	-	-	Red	Yes	X
Antelope-brush / prairie sandgrass - needle-and-thread grass / sidewalk screw-moss	*Purshia tridentata / Calamovilfa longifolia - Hesperostripa comata / Syntrichia ruralis*	-	-	Red	Yes	X
Antelope-brush / bluebunch wheatgrass	*Purshia tridentata / Pseudoroegneria spicata*	-	-	Red	Yes	High
Antelope-brush - common snowberry / bluebunch wheatgrass	*Purshia tridentata - Symphoricarpos albus / Pseudoroegneria spicata*	-	-	Red	Yes	X
Compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	*Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora*	-	-	Blue	Yes	X
Common snowberry - prairie rose	*Symphoricarpos albus - Rosa woodsii*	-	-	Blue	Yes	X
Common cattail Marsh	*Typha latifolia* Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked, with the exception of communities with a known occurrence.

"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.80 Plants of Concern with Mapped CDC Occurrences in the SKK LTL 219 Study Area

English Name	Mapped CDC occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
Hairstem groundsmoke	Overlaps	2,015,816	This is a general historic observation in Marysville from 1958, and overlaps the study area from its south end to approximate chainage 10+0
Prairie golden bean	Overlaps	1,833,571	This is a general historic observation from 1964 in Marysville, and overlaps the study area from its south end to approximate chainage 9+0
Scarlet gaura	Overlaps	1,833,571	This is a general historic observation from 1964 in Marysville, and overlaps the study area from its south end to approximate chainage 9+0
Spurless touch-me-not	Overlaps	1,859,341	Two occurrences, both from 1980. The larger occurrence overlaps the smaller, and overlaps the study area from its south end to approximate chainage 9+0

3.9.5 Wildlife

The SSK LTL 219 study area does not overlap with any mapped bald eagle or osprey nests, or provincial approved WMAs (DataBC 2018, WiTS 2018). The study area overlaps the Skookumchuck Prairie IBA between Tata Creek and Skookumchuck. This IBA holds a breeding population of long-billed curlew (*Numenius americanus*) that is known to breed and feed within grassland habitats, and feed in agricultural fields within the IBA. Other notable breeding bird species within the area include American kestrel (*Falco sparverius*), Lewis's woodpecker, western bluebird (*Sialia Mexicana*), mountain bluebird (*Sialia currucoides*) and western meadowlark (*Sturnella neglecta*). Most of the study area, is located within approved UWRs. The southern approximately 21 km of the study area overlaps with # U-4-006, and the northernmost 15 km of the study are overlaps with # U-4-008. Both UWRs have elk, bighorn sheep, moose, mule deer, and white-tailed deer as primary management species. The study area also overlaps with three provincials approved WHAs for wildlife:

- WHA 4-091: WHA for American badger, located along the west side of the lateral from approximate chainages 7+3 to 9+0, near McGinty Lake
- WHA 4-089: WHA for American badger, located along the east side of the lateral from approximate chainages 12+3 to 15.5
- WHA 4-068: WHA for long-billed curlew, located on the east side of the lateral from approximate chainages to 28+3 to 29+7

Field crews recorded and described four observations of wildlife and wildlife habitat features during PFR (**Table 3.81**)

Table 3.81 Wildlife and Wildlife Habitat Features Observed in the SSK LTL 219 Study Area during PFR

Feature ID	Description	Figure Reference
W001 / W002	Elk observed in area	KO-073 / KO-074
W003	Western toad spotted on RoW	KO-084
W004	Unidentified passerine ground nest in field adjacent to lateral	KO-092

Habitat within the study area consists mostly of grasslands, agricultural fields, and patches sparse coniferous forest ranging from age classes 2 to 8. Habitat present within the study area may provide foraging and nesting habitat for a variety of wildlife, including species of concern.

Desktop studies identified 19 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.82**). Four of these species have mapped CDC occurrences within the study area, though one of these species, sharp-tailed grouse, is now believed to be extirpated from the area and three have federally-designated critical habitat polygons within the study area (DataBC 2018) (**Table 3.83**). Desktop studies did not identify any mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.82 Wildlife of Concern with Medium or High Potential to Occur in the SSK LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Birds							
Bald Eagle	*Haliaeetus leucocephalus*	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Flammulated Owl	*Psiloscops flammeolus*	1-SC (Jun 2003)	SC (Apr 2010)	Blue	Yes	-	High
Great Blue Heron, herodias subspecies	*Ardea herodias herodias*	1-WA	-	Blue	Yes	Yes	Medium
Lewis's Woodpecker	*Melanerpes lewis*	1-T (Jul 2012)	T (Apr 2010)	Blue	Yes	-	High
Long-billed Curlew	*Numenius americanus*	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Upland Sandpiper	*Bartramia longicauda*	-	-	Blue	Yes	-	Medium
Western Screech-Owl, macfarlanei subspecies	*Megascops kennicottii macfarlanei*	1-T	T (May 2012)	Red	Yes	-	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High
Reptiles							
Northern Rubber Boa	*Charina bottae*	1-SC (Jan 2005)	SC (Apr 2016)	Yellow	Yes	-	High
Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	1-SC (Dec 2007)	SC (Nov 2016)	Blue	Yes	-	High
Invertebrates							
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.83 Wildlife of Concern with Mapped CDC Occurrences or Critical Habitat in the SSK LTL 219 Study Area

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	36,627,900	Occurrence overlaps with much of the East Kootenay Trench, which includes observations of 1,395 American badgers from 1945 to 2010. Occurrence overlaps the entire study area	-	-	-
Caribou	-	-	-	Overlaps	36,627,901	Mapped polygon overlaps with entire study area. Study area is located along eastern portion of critical habitat, which extends north to Canal flats and the Canada/USA border to the south Lateral overlaps low elevations of the polygon, where specific features that are considered critical habitat include: forests of cedar, hemlock and spruce; avalanche chutes, burns, and mineral licks (ECCC, 2014)
Lewis's Woodpecker	338	50,919	Mapped occurrence consists of several observations, two of which overlap the east side of the lateral near chainages 0+8 and 1+6. Last confirmed observation was from 1998	Overlaps	2,965,942	Numerous parcels of final critical habitat exist near the southernmost 5.7 km of the lateral Within parcels, critical habitat is identified where known and potential nesting trees exist (alive, standing or dead), plus a 400 m buffer around where key foraging habitat attributes (standing trees not exceeding 35% canopy closure and presence of fruit-bearing shrubs and perennial grasses) are present (ECCC, 2017)

English Name	Mapped CDC Occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Long-billed Curlew	Overlaps the study area	1,094,238	Mapped occurrence overlaps with east side of study area from approximate chainages 2+20 to 3+6	-	-	-
Northern Leopard Frog	-	-	-	493	45,121	Mapped polygon in which critical habitat (final) is found for the Upper Kootenay Floodplain population. Mapped polygon overlaps with the very eastern edge of study area, at approximate chainage 14+10
Sharp-tailed Grouse, Columbianus Subspecies	2 occurrences, 1 of which overlaps the study area	1,885,481	Southernmost occurrence overlaps only with the very southeast portion of the study area, and maps the extent of three observations from the Wycliffe area from 1989 Northernmost occurrence overlaps the study area and lateral from approximate chainages 34+1 to 35+8. Most recent sighting was from 1991 (unconfirmed)	-	-	-

3.10 FRD LTL 219 and FRD LTL 168

For the purposes of this report, FRD LTL 219 and FRD LTL 168 have been assessed together as one study area. FRD LTL 219 and FRD LTL 168 are 34.5 km and 45.1 km long, respectively. Both laterals are oriented an approximately south to north direction through the Michel Creek and Elk River valleys. The south end of FRD LTL 219 is approximately 14 km south of Eklford, BC. The two laterals connect at chainage 34+55, south of Elkford. The north end of FRD LTL 168 is in the Teck – Fording River Coal Mine operations area (**Figures KO-094** to **KO-143**).

These laterals were assessed between May 21 and 26, 2018. Laterals were assessed either by walking or by UTV where the terrain permitted. Work began at the southernmost point at the Site #21 Launcher station on Corbin Road and continued northward.

An overview of the identified environmental receptors within the study area is provided in **Sections 3.10.1 to 3.10.5**.

3.10.1 Land Use

The FRD LTL 219 and FRD LTL 168 study area has been heavily influenced by industrial mining activity. FRD LTL 219 roughly parallels major highways (Highway 3 and 43) as well as the CPR tracks that run through the Elk Valley. This lateral crosses or is aligned immediately adjacent to these features in multiple locations. The lateral is located 500 m west of the Sparwood / Elk Valley Airport at approximate chainage 27+0. FRD LTL 168 is located on the west side of Highway 43 and interacts with this highway in several locations. North of Elkford, FRD LTL 168 roughly parallels Fording Highway and CPR tracks to the north end in Fording River. Much of the study area between Sparwood and Elkford lies within ALR land. A summary of the land use within the study area is provided in (**Table 3.84**).

Table 3.84 Overview of Land Use within the FRD LTL 219 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Crown Agency: 4.5 **Crown Provincial**: 230.9 **Municipal**: 39.0 **Private**: 1033.5 **None**: 31.8 **Unknown**: 1.3	East Kootenay	Sparwood, Elkford	Lateral runs through Nature Trust of British Columbia Conservation Lands, north of Sparwood between approximate chainages 28+0 to 31+2 Study area overlaps with the Mountain Meadows Golf Club, located on the west side of Highway 43 in Elkford	406.5	43	**3:** 5.3 **4:** 200.1 **5:** 171.1 **6:** 20.2 **No Data:** 9.8

3.10.2 Contaminated Sites

Details of the APECs identified through the desktop assessment along FRD LTL 168 and FRD LTL 219 are provided in **Table 3.85** and **Table 3.86**. Twelve and thirteen APECs were identified along FRD LTL 168 and FRD LTL 219, respectively. Of the APECs identified along FRD LTL 168, two are considered low risk, seven are considered medium risk and the remaining three are high risk. Of the APECs identified along FRD LTL 219, five are considered low risk and the remaining eight are considered medium risk.

Table 3.85 Summary of Areas of Potential Environmental Concern for FRD LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
FRD LTL 168 (ILI)							
W1	Site Registry entry noting Notice of Independent Remediation Completion (22km North of Sparwood on Highway 43)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, metals, chlorinated and non-chlorinated phenols	Site Reg (Site ID 20872)	On-Site	Medium	550	KO-120
W2	Former Service Station (6 Front Street, Elkford)	BTEX/VPH, EPH, PAHs, VOCs, metals	Site Reg (Site ID 7244)	30 m east	Medium	95	KO-113
W3	Active Service Station - Elkford Mini-Mart & Fas Gas (Alpine Way, Elkford)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	50 m northwest	Medium	45	KO-113
W4	Active Service Station - Race Trac Gas (351 Alpine Way, Elkford)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	High	185	KO-113
W5	Former Cement Plant (east of Elk River and west of Fording River Road, outside of Elkford)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	10 m west	Low	300	KO-112
W6	Mine Operations - Teck Coal Ltd. Greenhills Operations (Fording River Road, north of Elkford)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial Imagery	Adjacent	High	1,000	KO-108 and KO-109
W7	Railway Crossing (north of Fording Forest Service Road, south of Fording River Road)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	11	KO-107

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
W8	Railway Crossing (east of Fording River Road, south of Erwin Creek)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-104
W9	Railway Crossing (east of Fording River Road, east of Fording River)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-102
W10	Oil and Gas Well - Encana Oil & Gas Co Ltd. (east of Fording River Road)	BTEX/VPH, EPH, PAHs, metals	Eris Ecolog (BOGW)	90 m east	Low	110	KO-101
W11	Railway Crossing (south of Chauncey Creek, east of Fording River Road)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-100
W12	Coal Mining Operations - Teck Coal Ltd. Fording River (Fording River Road)	BTEX/VPH, EPH, PAHs, VOCs, metals	AMS	On-Site	High	2310	KO-094 and KO-095

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons
AMS – Authorization Management System

Table 3.86 Summary of Areas of Potential Environmental Concern for FRD LTL 219

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
FRD LTL 219 (Inland Gas Upgrade Project							
U1	Railway Crossing (south of Corbin Road)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	35	KO-142
U2	Railway Crossing (north of Corbin Road)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	35	KO-142
U3	Equipment Storage - Teck Coal (Highway 3, south of Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial Imagery	40 m west	Low	485	KO-137
U4	Bus Repair Facility (Highway 3, south of Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial Imagery	40 m west	Low	235	KO-136
U5	Railway Crossing	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	25	KO-135

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
	(south of G North Road, north of Michel Creek, Sparwood)						
U6	Industrial Area Sparwood (Industrial 1 Road, Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	Aerial Imagery	15 m east	Medium	100	KO-135
U7/V1	Water Management Pond – Teck (north of Michel Creek Road, Sparwood)	Metals	Aerial Imagery	30 m west	Low	410	KO-134
U8	Equipment Storage, Repair and Trucking - Manitoulin Transport (585 Michel Creek Road, Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	Site Reg (Site ID 13010)	60 m south	Medium	195	KO-134
U9	Metal Working Shop - Rayco Steel (655 Michel Creek Rd, Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	SCT	50 m south	Low	175	KO-134
U10	Railway Crossing (north of Elk Valley Hwy and east of Elk River, Sparwood)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	60	KO-134
U11	Former Mine Workings (east of Elk River, Sparwood)	Metals	Aerial Imagery	30 m east	Medium	560	KO-132 and KO-134
U12	Railway Crossing (east of Elk Valley Hwy and west of Elk River, Sparwood)	BTEX/VPH, EPH, PAHs, metals	Aerial Imagery	On-Site	Medium	10	KO-132
U13	Former gravel pit with Site Registry entry (Highway 43, Sparwood)	BTEX/VPH, EPH, PAHs, metals	Site Reg (Site ID 3809)	Adjacent	Low	415	KO-132

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
Site Reg – BC MOE Online Site Registry
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons
SCT – Scott's Manufacturing Directory

3.10.3 Fish and Fish Habitat

Seventy-six FWA mapped watercourses were identified within the FRD LTL 168 study area during desktop analysis. During PFR activities, 29 FWA mapped watercourses were observed to have no identifiable stream channel, and an additional 14 unmapped waterbodies were observed and subsequently mapped. Ten watercourses were inaccessible (e.g., presence was not confirmed, or biophysical features not collected); however, they are conservatively being included as having potential to interact with gas main upgrade activities. Fording River crosses the alignment tree times (KO_FRD LTL 168_001, 022, and 025), the Elk River crosses the alignment five times (KO_FRD LTL 168_045, 051, 052, 057, and 060). Each of these crossings was assigned its own unique ID for purposes of identification and assessment of riparian setbacks. A total of 61 watercourses potentially require riparian setbacks, depending on the selected upgrade option and construction footprint.

Thirty-seven watercourses (KO_FRD LTL 186_001 to 005, and 024 to 056) are located within the District Municipality of Elkford, which requires a Riparian Areas Development Permit and 30 m riparian setbacks for watercourses (**Section 4.4.3**). The remaining 39 watercourses require RMA setbacks as per FRPA. It is recommended the more conservative provincial FRPA RMA setbacks are applied to all watercourses.

Waterbodies within the FRD LTL 168 study area are summarized in **Table 3.87** and biophysical descriptions are provided in **Appendix D**.

Desktop studies identified one fish species of concern with high potential to occur within the FRD LTL 168 study area and one fish species of concern with medium potential to occur within the study area (**Table 3.89**). This species does not have any known occurrences or federally-designated critical habitat within the study area (DataBC 2018).

Table 3.87 Summary of Waterbodies within the FRD LTL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
FRD LTL 168							
KO_FRD LTL 168_001 (Fording River)	Stream - permanent	5	Yes	Yes	S2	50	KO-094
KO_FRD LTL 168_002	Settlement Pond	0	No	Yes	N/A	N/A	KO-094
KO_FRD LTL 168_003	Settlement Pond	0	No	Yes	N/A	N/A	KO-094, KO-095
KO_FRD LTL 168_004	Stream - permanent	0	UKN	Yes	S2	50	KO-095
KO_FRD LTL 168_005	Settlement Pond	21	No	Yes	N/A	N/A	KO-095
KO_FRD LTL 168_006	NSCI	0	No	Yes	N/A	N/A	KO-096
KO_FRD LTL 168_007	NSCI	0	No	Yes	N/A	N/A	KO-097
KO_FRD LTL 168_008	NSCI	5	Yes	Yes	N/A	N/A	KO-097

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 168_009	Stream - permanent	0	Yes	Yes	N/A	N/A	KO-098
KO_FRD LTL 168_010	Stream - permanent	0	UKN	Yes	S3	40	KO-098
KO_FRD LTL 168_011	Stream - permanent	0	UKN	Yes	S3	40	KO-098
KO_FRD LTL 168_012	Stream - permanent	0	UKN	Yes	S4	30	KO-098
KO_FRD LTL 168_013	Wetland	0	UKN	Yes	W1	50	KO-099
KO_FRD LTL 168_014	Stream - permanent	0	UKN	Yes	S4	30	KO-099
KO_FRD LTL 168_015	NSCI	0	No	Yes	N/A	N/A	KO-099
KO_FRD LTL 168_016	NSCI	0	No	Yes	N/A	N/A	KO-099
KO_FRD LTL 168_017	Stream - permanent	0	Yes	Yes	S2	50	KO-100
KO_FRD LTL 168_018	Stream - intermittent	0	UKN	Yes	UKN	UKN	KO-101
KO_FRD LTL 168_019	NSCI	0	No	Yes	N/A	N/A	KO-101
KO_FRD LTL 168_020	NSCI	0	No	Yes	N/A	N/A	KO-101
KO_FRD LTL 168_021	NSCI	0	No	Yes	N/A	N/A	KO-102
KO_FRD LTL 168_022 (Fording River)	Stream - permanent	0	Yes	Yes	S2	50	KO-103
KO_FRD LTL 168_023	UKN	0	UKN	Yes	UKN	UKN	KO-103
KO_FRD LTL 168_024	UKN	0	UKN	Yes	UKN	UKN	KO-103
KO_FRD LTL 168_025 (Fording River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-103
KO_FRD LTL 168_026 (Ewin Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-104
KO_FRD LTL 168_027	NSCI	0	No	Yes	N/A	N/A	KO-104
KO_FRD LTL 168_028	NSCI	0	No	Yes	N/A	N/A	KO-104
KO_FRD LTL 168_029	Wetland	0	UKN	Yes	W3	30	KO-105
KO_FRD LTL 168_030	Wetland	0	UKN	Yes	N/A*	N/A	KO-105
KO_FRD LTL 168_031	Wetland	0	UKN	Yes	N/A*	N/A	KO-105

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 168_032	Stream - permanent	0	UKN	Yes	S4	30	KO-105
KO_FRD LTL 168_033	Wetland	0	UKN	Yes	N/A*	N/A	KO-105
KO_FRD LTL 168_034	Wetland	0	UKN	Yes	N/A*	N/A	KO-106
KO_FRD LTL 168_035	Stream - permanent	0	Yes	Yes	S3	40	KO-106
KO_FRD LTL 168_036	Stream - permanent	0	Yes	Yes	S1B	70	KO-107
KO_FRD LTL 168_037	NSCI	0	No	Yes	N/A	N/A	KO-108
KO_FRD LTL 168_038	Stream - permanent	0	UKN	Yes	S4	30	KO-109
KO_FRD LTL 168_039	Stream - permanent	0	Yes	Yes	S3	40	KO-109
KO_FRD LTL 168_040	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-109
KO_FRD LTL 168_041	NSCI	0	No	Yes	N/A	N/A	
KO_FRD LTL 168_042	Stream - intermittent	0	UKN	Yes	S3	40	KO-110
KO_FRD LTL 168_043	Stream - permanent	0	UKN	Yes	S3	40	KO-111
KO_FRD LTL 168_044	Stream - permanent	0	UKN	Yes	S3	40	KO-111
KO_FRD LTL 168_045 (Elk River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-112 KO-113
KO_FRD LTL 168_046 (Bovin Creek)	Stream - permanent	90	Yes	Yes	S2	50	KO-113
KO_FRD LTL 168_047	Stream - permanent	45	UKN	Yes	UKN	UKN	KO-114
KO_FRD LTL 168_048	Stream - permanent	0	UKN	Yes	S2	50	KO-114
KO_FRD LTL 168_049	NSCI	0	No	Yes	N/A	N/A	KO-115
KO_FRD LTL 168_050	NSCI	0	No	Yes	N/A	N/A	KO-115
KO_FRD LTL 168_051 (Elk River)	Stream - permanent	0	Yes	Yes	S2	50	KO-116
KO_FRD LTL 168_052 (Elk River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-116
KO_FRD LTL 168_053	NSCI	0	No	Yes	N/A	N/A	KO-116

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 168_054	Stream - permanent	0	UKN	Yes	S4	30	KO-116
KO_FRD LTL 168_055	NSCI	50	No	Yes	N/A	N/A	KO-117
KO_FRD LTL 168_056	NSCI	0	No	Yes	N/A	N/A	KO-117
KO_FRD LTL 168_057 (Elk River)	Stream - permanent	60	Yes	Yes	S1B	70	KO-117
KO_FRD LTL 168_058	NSCI	85	No	Yes	N/A	N/A	KO-117
KO_FRD LTL 168_059	NSCI	0	No	Yes	N/A	N/A	KO-117
KO_FRD LTL 168_060 (Elk River)	Stream - permanent	20	Yes	Yes	S1B	70	KO-118
KO_FRD LTL 168_061	NSCI	0	No	Yes	N/A	N/A	KO-118
KO_FRD LTL 168_062	Stream - intermittent	0	UKN	Yes	UKN	UKN	KO-118
KO_FRD LTL 168_063	Stream - intermittent	0	UKN	Yes	UKN	UKN	KO-118
KO_FRD LTL 168_064	NSCI	0	No	Yes	N/A	N/A	KO-118
KO_FRD LTL 168_065	NSCI	0	No	Yes	N/A	N/A	KO-118
KO_FRD LTL 168_066	NSCI	0	No	Yes	N/A	N/A	KO-118 KO-119
KO_FRD LTL 168_067	NSCI	30	No	Yes	N/A	N/A	KO-119
KO_FRD LTL 168_068	NSCI	45	No	Yes	N/A	N/A	KO-119
KO_FRD LTL 168_069	NSCI	60	No	Yes	N/A	N/A	KO-119
KO_FRD LTL 168_070	NSCI	0	No	Yes	N/A	N/A	KO-119
KO_FRD LTL 168_071	Stream - permanent	35	UKN	Yes	UKN	UKN	KO-119
KO_FRD LTL 168_072	NSCI	0	No	Yes	N/A	N/A	KO-119 KO-120
KO_FRD LTL 168_073 (Weigert Creek)	Stream - permanent	0	Yes	Yes	S3	40	KO-120
KO_FRD LTL 168_074	Stream - permanent	0	Yes	Yes	S3	40	KO-120
KO_FRD LTL 168_075	Stream - intermittent	0	UKN	Yes	S3	40	KO-121
KO_FRD LTL 168_076	NCD	0	No	Yes	N/A	N/A	KO-121

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 168_077	Wetland	0	UKN	No	N/A*	N/A	KO-113
KO_FRD LTL 168_078	NCD	0	No	No	N/A	N/A	KO-112
KO_FRD LTL 168_079	Stream - intermittent	0	UKN	No	UKN	UKN	KO-109
KO_FRD LTL 168_080	Wetland	0	UKN	No	N/A*	N/A	KO-107
KO_FRD LTL 168_081	Stream - permanent	0	UKN	No	S3	40	KO-104
KO_FRD LTL 168_082	Stream - permanent	0	UKN	No	S4	30	KO-104
KO_FRD LTL 168_083	Stream - permanent	0	UKN	No	UKN	UKN	KO-096
KO_FRD LTL 168_084	Settlement Pond	32	No	No	N/A	N/A	KO-109
KO_FRD LTL 168_085	NCD	0	No	No	N/A	N/A	KO-105
KO_FRD LTL 168_086	NCD	0	No	No	N/A	N/A	KO-105
KO_FRD LTL 168_087	NCD	0	No	No	N/A	N/A	KO-105
KO_FRD LTL 168_088	NCD	0	No	No	N/A	N/A	KO-105
KO_FRD LTL 168_089	NCD	0	No	No	N/A	N/A	KO-105
KO_FRD LTL 168_090	Wetland	0	UKN	No	N/A*	N/A	KO-119

0 = crosses lateral; NSCI = no stream channel identified; NCD= Non-classified drainage; N/A = not applicable; UKN = unknown
*wetland < 1 ha in MS biogeoclimatic zone; no FRPA classification

Thirty-five FWA mapped watercourses were identified within the FRD LTL 219 study area during desktop analysis. During PFR activities, nine of these watercourses were observed to have no identifiable stream channel, and an additional eight unmapped waterbodies were observed and subsequently mapped. Twelve watercourses were inaccessible (i.e., presence was not confirmed, or biophysical features not collected); however, they were conservatively included as having potential to interact with gas main upgrade activities.

Michel Creek crosses the alignment twice (KO_FRD LTL 219_018 and 023) and each crossing was assigned its own unique ID. A total of 34 watercourses potentially require riparian setbacks, depending on selected upgrade option and construction footprint.

Twenty watercourses (KO_FRD LTL 219_014 to 033) are located within the District Municipality of Sparwood, which requires a Development Permit for land within Riparian Protection Development Permit Areas (**Section 4.5.2**). Additionally, the District Municipality of Sparwood requires specific setbacks on the following watercourses:

- Elk River: 30 m

- Michel Creek: 30 m
- Bodie Creek: 15 m
- Cummings Creek: 15 m
- Unnamed tributaries of Elk River and Michel Creek: 10 m.

The remaining 14 watercourses require RMA setbacks as per FRPA. It is recommended the more conservative provincial FRPA RMA setbacks are observed for all watercourses.

Waterbodies within the FRD LTL 219 study area are summarized in **Table 3.88** and **Table 3.87** biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with high potential to occur within the FRD LTL 219 study area and one fish species of concern with medium potential to occur within the study area (**Table 3.89**). This species does not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.88 Summary of Waterbodies within the FRD LTL 219 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
FRD LTL 219							
KO_FRD LTL 219_001	Stream - permanent	0	Yes	Yes	S2	50	KO-122
KO_FRD LTL 219_002	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-122, KO-123
KO_FRD LTL 219_003	NSCI	0	No	Yes	N/A	N/A	KO-123
KO_FRD LTL 219_004	NSCI	0	No	Yes	N/A	N/A	KO-123
KO_FRD LTL 219_005	NSCI	0	No	Yes	N/A	N/A	KO-123
KO_FRD LTL 219_006	NSCI	0	No	Yes	N/A	N/A	KO-125
KO_FRD LTL 219_007 (Dalzell Creek)	Stream - permanent	0	Yes	Yes	UKN	UKN	KO-127
KO_FRD LTL 219_008 (Littlemoor Creek)	Stream - permanent	0	Yes	Yes	UKN	UKN	KO-128
KO_FRD LTL 219_009	Stream - permanent	5	UKN	Yes	UKN	UKN	KO-128
KO_FRD LTL 219_010 (Hollow Creek)	Stream - intermittent	0	UKN	Yes	UKN	UKN	KO-128
KO_FRD LTL 219_011	Stream - intermittent	0	No	Yes	UKN	UKN	KO-131
KO_FRD LTL 219_012	NSCI	0	No	Yes	N/A	N/A	KO-131

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 219_013 (Whiting Creek)	Stream - permanent	0	UKN	Yes	S4	30	KO-131
KO_FRD LTL 219_014 (Cummings Creek)	Stream - permanent	0	Yes	Yes	S1B	70	KO-132
KO_FRD LTL 219_015 (Elk River)	Stream - permanent	0	Yes	Yes	S1B	70	KO-132
KO_FRD LTL 219_016	NCD	0	No	Yes	N/A	N/A	KO-134
KO_FRD LTL 219_017	Stream - permanent	0	UKN	Yes	S4	40	KO-134
KO_FRD LTL 219_018 (Michel Creek)	Stream - permanent	20	Yes	Yes	S2	50	KO-135
KO_FRD LTL 219_019	NSCI	0	No	Yes	N/A	N/A	KO-135
KO_FRD LTL 219_020 (Bodie Creek)	Stream - permanent	0	Yes	Yes	UKN	UKN	KO-137
KO_FRD LTL 219_021	Stream - permanent	0	Yes	Yes	S3	40	KO-137
KO_FRD LTL 219_022	NSCI	0	No	Yes	N/A	N/A	KO-137
KO_FRD LTL 219_023 (Michel Creek)	Stream - permanent	0	Yes	Yes	S2	50	KO-138
KO_FRD LTL 219_024	Stream - permanent	75	UKN	Yes	UKN	UKN	KO-138
KO_FRD LTL 219_025	Stream - permanent	65	UKN	Yes	UKN	UKN	KO-139
KO_FRD LTL 219_026	Stream - permanent	0	UKN	Yes	S3	40	KO-139
KO_FRD LTL 219_027	Stream - permanent	0	UKN	Yes	S3	40	KO-139
KO_FRD LTL 219_028	Stream - permanent	10	UKN	Yes	S2	50	KO-139
KO_FRD LTL 219_029 (Robert Creek)	Stream - permanent	0	UKN	Yes	UKN	UKN	KO-139
KO_FRD LTL 219_030	Stream - permanent	85	UKN	Yes	UKN	UKN	KO-139
KO_FRD LTL 219_031	Stream - permanent	0	UKN	Yes	S2	50	KO-141
KO_FRD LTL 219_032	NSCI	0	UKN	Yes	N/A	N/A	KO-141
KO_FRD LTL 219_033	Stream - permanent	0	UKN	Yes	S3	40	KO-142

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_FRD LTL 219_034	NSCI		UKN	Yes	N/A	N/A	KO-143
KO_FRD LTL 219_035	Stream - permanent	0	Yes	Yes	UKN	UKN	KO-142
KO_FRD LTL 219_036	Settlement Pond	35	No	No	N/A	N/A	KO-132
KO_FRD LTL 219_037	Stream - permanent	0	UKN	No	S30	4	KO-143
KO_FRD LTL 219_038	Stream - permanent	0	UKN	No	S4	30	KO-143
KO_FRD LTL 219_039	Stream - permanent	0	UKN	No	S4	30	KO-143
KO_FRD LTL 219_040	Stream - permanent	0	UKN	No	S4	30	KO-143
KO_FRD LTL 219_041	Stream - permanent	0	UKN	No	S4	30	KO-143
KO_FRD LTL 219_042	Wetland	0	UKN	No	S4	30	KO-139
KO_FRD LTL 219_043	Wetland	0	UKN	No	S4	30	KO-139

0 = crosses lateral; NSCI = no stream channel identified; NCD= Non-classified drainage; N/A = not applicable; UKN = unknown
*wetland < 1 ha in MS biogeoclimatic zone; no FRPA classification

Table 3.89 Fish Species of Concern with Medium or High Potential to Occur in the FRD LTL 219 and FRD LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC = special concern

3.10.4 Vegetation

The FRD LTL 219 and FRD LTL 168 study area is located mostly within the Montane Spruce Dry Cool (MSdk) subzone, with some portions at higher elevations within the Engelmann Spruce-Subalpine Fir Dry Cool (ESSFdk) subzones. These subzones occur on mid-slopes and subalpine elevations of the Rocky Mountains. Common climax species include hybrid white spruce (*Picea glauca x engelmannii),* Engelmann spruce (*P. engelmannii*) and subalpine fir (*Abies lasiocarpa*). Common understory species include black huckleberry (*Vaccinium membranaceum)*, pinegrass (*Calamagrostis rubescens)*, falsebox (*Paxistima myrsinites)*, Utah honeysuckle (*Lonicera utahensis)*, and grouseberry (*V. scoparium)* (Coupe et al. 1991, Hope et al. 1991). Vegetation along the study area varies, ranging from agricultural fields, cleared RoWs, unforested areas associated with urban and rural areas and mining operations, and patches deciduous, mixed, and coniferous forest. Forested areas of the study area range from age class 8 to 9 (DataBC, 2018), and are dominated primarily by lodgepole pine and Engelmann spruce, as well as trembling aspen and poplar (*Populus* spp.*)* (DataBC, 2018). No legal OGMAs were identified within the study area during the desktop studies, however stands of old growth forest (i.e., age classes 8 and 9) are shown by the VRI, covering a total approximate area of 64 ha within the study area (DataBC, 2018).

Approximately 8.13 ha of invasive vegetation (comprised of 12 species and distributed over 45 sites) were identified in the study area during the desktop search. An additional 18 sites of invasive vegetation were also identified during the PFR (**Table 3.90**).

Table 3.90 Invasive Vegetation Identified within the FRD LTL 168 & 219 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act)*
Burdock species	*Arctium spp*	BU	Noxious (Regionally)
Blueweed	*Echium vulgare*	BW	Noxious (Regionally)
Canada thistle	*Cirsium arvense*	CT	Noxious (Provincially)
Diffuse knapweed	*Centaurea diffusa*	DK	Noxious (Provincially)
Oxeye daisy	*Leucanthemum vulgare*	OD	Noxious (Regionally)
Orange hawkweed	*Hieracium aurantiacum*	OH	Noxious (Regionally)
Scentless chamomile	*Matricaria perforata*	SH	Noxious (Provincially)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Common tansy	*Tanacetum vulgare*	TC	Noxious (Regionally)
Wormwood	*Artemisia absinthium*	WW	Invasive
Yellow hawkweed	*Hieracium pratense*	YH	Invasive
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		12
	Number of Sites		63
	Total Area (m^2)		81,333

Desktop studies identified one plant species of concern (whitebark pine (*Pinus albicaulis*)) with medium potential to occur within the study area (**Table 3.91**). This species also has federally-designated critical habitat polygons overlapping the study area (**Table 3.92**). Additionally, four provincially red- or blue-listed species are considered to have high potential to occur within the study area based on mapped CDC occurrences (**Table 3.91**). During the PFR, field crews recorded an unconfirmed occurrence of Drummond's milk vetch (*Astragalus drummondii*) near Michel Creek (approximate location at **V001**, figure **KO-135**). Identification could not be confirmed due to the early growth stage of the plants present. No other plant species of concern have mapped CDC occurrences within the study area, or federally-designated critical habitat polygons within or overlapping the study area (DataBC 2018). Ten at-risk ecological communities overlap with the BEC subzones present within the study area (**Table 3.91**). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018).

Table 3.91 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the FRD LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Drummond's milk-vetch	*Astragalus drummondii*	-	-	Red	-	High
Rocky Mountain willowherb	*Epilobium saximontanum*	-	-	Red	-	High
Sweet-flowered fairy-candelabra	*Androsace chamaejasme* ssp. *lehmanniana*	-	-	Blue	-	High
Whitebark pine	*Pinus albicaulis*	1-E (Jul 2012)	E (Apr 2010)	Blue	-	Medium
Wyoming kitten-tails	*Synthyris wyomingensis*	-	-	Blue	-	High
Ecological communities						
Western pasqueflower - black alpine sedge	*Anemone occidentalis - Carex nigricans*	-	-	Red	Yes	X
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Scheuchzer's cotton-grass Herbaceous Vegetation	*Eriophorum scheuchzeri* Herbaceous Vegetation	-	-	Red	Yes	X
Rough fescue - sulphur buckwheat - thread-leaved sandwort	*Festuca campestris - Eriogonum umbellatum - Eremogone capillaris*	-	-	Red	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Eriogonum umbellatum - Eremogone capillaris*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Pseudoroegneria spicata - Eriogonum umbellatum - Eremogone capillaris*	-	-	Blue	Yes	X
Drummond's willow / bluejoint reedgrass	*Salix drummondiana / Calamagrostis canadensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

Table 3.92 Plants of Concern with Mapped CDC occurrences or Critical Habitat in the FRD LTL 219 Study Area

English Name	Mapped CDC occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
Drummond's milk-vetch	Overlaps	401,275	Mapped observation is from 1981 and overlaps lateral between approximate chainages of 8+60 and 10+60. Possible observation (identification not confirmed) of this species during PFR near Michel Creek near approximate chainage 27+4	-	-	-
Rocky Mountain willowherb	Overlaps	28,851	Mapped occurrence is from 1981, and overlaps the lateral at approximate chainage 6+3 (at KO_FRD LTL 168_027)	-	-	-
Sweet-flowered fairy-candelabra	Overlaps	1,683,990	Mapped occurrence is from 1984, and overlaps the northernmost approximately 8.4 km of the lateral	-	-	-
Whitebark pine	-	-	-	Overlaps	7,902,886	Study area overlaps with federally-proposed critical habitat polygon. This includes areas identified as both the known range and a 2 km regeneration/recovery zone. Within these areas, critical habitat is identified as the following: **Known range:** Any cone-bearing or non-terminally infected whitebark pine; and/or Any substrate areas that are within the subsurface root area of existing individuals, and/or open at the surface later and has well-to rapidly-drained, coarse or rocky soils or serpentine soils

English Name	Mapped CDC occurrences			Critical Habitat		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments	Distance from Lateral (m)	Overlap with Study Area (m^2)	Comments
						2 km recovery zone: Natural open parkland and forest openings that are greater than or equal to 0.5 ha in area, have suitable substrates for regeneration, and occur within the known regional elevation limits and the projected climate change envelope model limits Existing utility corridors are not identified as critical habitat (ECCC 2017)
Wyoming kitten-tails	Overlaps	1,718,800	Mapped occurrence is from 1984, and overlaps the lateral from approximate chainages 55+1 to 63+5	-	-	-

3.10.5 Wildlife

The FRD LTL 219 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial WHAs or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Most of the study area is located within an approved UWR (# U-4-006) for elk, bighorn sheep, mule deer, moose, and white-tailed deer. Field crews recorded and described two observations of wildlife species of concern and two wildlife habitat features during the PFR (**Table 3.93** and **Table 3.94**).

Table 3.93 Wildlife and Wildlife Habitat Features Observed in the FRD LTL 219 and FRD LTL 168 Study Area during PFR

Feature ID	Description	Figure Reference
W001	Wildlife tree (stump) adjacent to RoW	KO-135
W002	Wildlife tree (coniferous snag) adjacent to RoW	KO-134
W003	Fenced off area with "Wildlife Improvement Area" sign, located along RoW near chainage 19+2. Target species or responsible party was not identified on sign	KO-132
W004	Osprey nest on electrical pole. Active at the time of PFR	KO-120
W005	Small elk (*Cervus elaphus)* herd (approximately 15 animals) grazing in field adjacent to RoW	KO-114

A variety of wildlife habitat is available within the study area, including areas of old-growth (i.e., age classes 8 and 9) coniferous forest, deciduous forest stands, cleared fields, small streams, river valleys, and wetlands. Available habitat may provide wildlife with migration corridors (for both migration and dispersal), security and thermal habitat, and areas for nesting, denning and breeding.

Desktop studies identified 20 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.94**). Two of these species have mapped CDC occurrences within the study area (**Table 3.95**). None of these species have federally-designated critical habitat polygons within the study area (DataBC 2018). Similarly, there were no mapped masked (i.e., confidential) CDC occurrences identified within the study area (DataBC 2018).

Table 3.94 Wildlife of Concern with Medium or High Potential to Occur in the FRD LTL 219 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Bighorn Sheep	*Ovis canadensis*	-	-	Blue	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Fisher	*Pekania pennanti*	-	-	Blue	Yes	-	High
Grizzly Bear	*Ursus arctos*	-	SC (May 2002)	Blue	Yes	-	High
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Bald Eagle	Haliaeetus leucocephalus	-	NAR (1984)	Yellow	-	Yes	High
Barn Swallow	Hirundo rustica	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	Chordeiles minor	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Great Blue Heron, herodias subspecies	Ardea herodias herodias	1-WA	-	Blue	Yes	Yes	High
Long-billed Curlew	Numenius americanus	1-SC (Jan 2005)	SC (May 2011)	Blue	Yes	-	High
Olive-sided Flycatcher	Contopus cooperi	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	Pandion haliaetus	-	-	Yellow			High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Invertebrates							
Gillette's Checkerspot	*Euphydryas gillettii*	-	-	Red	Yes	-	High
Magnum Mantleslug	*Magnipelta mycophaga*	1-SC	SC (May 2012)	Blue	-	-	High
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.95 Wildlife of Concern with Mapped CDC Occurrences in the FRD LTL 219 Study Area

English Name	Mapped CDC Occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
American Badger	Overlaps	53,789,747	There are 181 recorded observations of live, dead and road-killed American Badgers in the Elk Valley. The last observation was in 2010 and included 23 kits. Occurrence overlap with study area is from the southern extent of lateral (chainage 0+0) to approximately chainage 54+6
Gillette's Checkerspot	11	714,801	Historic observation (1990) near southern extent of lateral, near 0+0 to 2+2. No observations during 2008 and 2012 surveys

3.11 ELK LTL 168

The ELK LTL 168 lateral is 1.6 km long and is aligned north off the FRD LTL 168 at the Elkview LTL 168 Crossover Plant (**Figures KO-133**). The proposed location of the PRS (Site #24) is at the south end of the lateral.

The lateral was assessed on May 23, 2018 by UTV[5]. An overview of the identified environmental receptors within the study area is provided in **Sections 3.11.1 to 3.11.5**.

3.11.1 Land Use

Much of this lateral is adjacent to mining activities at the Teck Elkview Operations. This lateral runs through only private land with no occurrences of agricultural land. The proposed location of the PRS (Site #24) is located on the north roadside shoulder of Michel Creek Road adjacent to the industrial access road to the Teck Elkview facility, A summary of the land use within the study area is provided in **Table 3.96**.

Table 3.96 Overview of Land Use within the ELK LTL 168 Study Area

Land Ownership (ha)	Regional Districts	Municipalities	Parks, and Protected Areas	ALR		
				Area within Study Area (ha)	# Parcels Intersected by Alignment	Soil Agricultural Capability Classes (ha)
Private: 34.3	East Kootenay	Sparwood	-	-	-	**-**

3.11.2 Contaminated Sites

Details of the two APECs identified through the desktop assessment along ELK LTL 168 are provided in **Table 3.97**. Both identified APECs are medium risk.

Table 3.97 Summary of Areas of Potential Environmental Concern for ELK LTL 168

APEC ID	Description and Location	PCOCs	Information Source	Location and Distance to Lateral	Risk Classification	Length (m)	Figure
ELK LTL 168 (ILI)							
U7/V1	Water Management Pond – Teck (north of Michel Creek Road, Sparwood)	Metals	Aerial Imagery	30 m west	Medium	650	KO-133
V2	Mine Water Management Works (including electrical substation) (Industrial 2 Road, Sparwood)	BTEX/VPH, EPH, PAHs, PCBs, metals	Aerial Imagery	50 m east	Medium	170	KO-133

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VPH – Volatile Petroleum Hydrocarbons
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls

5 At the time of field studies the entire alignment was assessed

3.11.3 Fish and Fish Habitat

One FWA mapped watercourse was identified within the ELK LTL 168 study area during desktop analysis. During PFR activities the watercourse was observed entering a culvert within the ROW on the eastern side of the alignment where it continued underground across the ROW.

This waterbody is in the District Municipality of Sparwood, which requires a Development Permit for land within Riparian Protection Development Permit Areas (**Section 4.5.2**). However, it is recommended the more conservative provincial FRPA RMA setback is observed. The PRS Site #24 construction footprint does not interact with any watercourses; therefore, riparian setbacks are not required for the PRS activity.

Waterbodies are summarized in **Table 3.98** and biophysical descriptions are available in **Appendix D**.

Desktop studies identified one fish species of concern with high potential to occur within the study area and one fish species of concern with medium potential to occur within the study area (**Table 3.99**). These species do not have any known occurrences or federally designated critical habitat within the study area (DataBC 2018).

Table 3.98 Summary of Waterbodies within the ELK LTL 168 Study Area

Watercourse ID	Type	Distance from Alignment (m)	Fish Bearing	Mapped Watercourse	FRPA Classification	RMA (m)	Figure Reference
KO_ELK LTL 168_001	Stream	N/A	Yes	Yes	S2	50	KO-133

NSCI = no stream channel identified; N/A = not applicable

Table 3.99 Fish Species of Concern with Medium or High Potential to Occur in the ELK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Bull Trout	*Salvelinus confluentus*	-	SC (Nov 2012)	Blue	Yes	-	High
Cutthroat Trout, lewisi subspecies	*Oncorhynchus clarkii lewisi*	1-SC (Feb 2010)	SC (Nov 2016)	Blue	Yes	-	Medium

SC =special concern

3.11.4 Vegetation

The ELK LTL 168 study area is located within the MSdk subzone (Hope et al. 1991). Much of the study area is unforested, particularly on the west side of the lateral along the edge of the tailings pond. Stands of mixed forest (including larch and trembling aspen), and grassy areas with low-lying shrubs are present on the west side of the lateral. No legal OGMAs or areas of old growth forest were identified within the study area. The proposed location of the PRS (Site #24) is situated on a cleared roadside shoulder and overlaps with a small patch of mature trembling aspen and mixed conifers. At the time of PFR activities, the non-treed portion of thePRS footprint had been recently cleared of vegetation.

Approximately 3 m² of invasive vegetation (comprised of three species in one site) were identified in the study area during the desktop search, just south of the proposed location of the PRS (Site #24) (**Table 3.100**). No additional invasive plants were identified during the PFR.

Table 3.100 Invasive Vegetation Identified within the ELK LTL 168 Study Area

English Name	Scientific Name	Species Code	Designation (*Weed Act*)
Spotted knapweed	*Centaurea biebersteinii*	SK	Noxious (Provincially)
Wormwood	*Artemisia absinthium*	WW	Invasive
Yellow/common toadflax	*Linaria vulgaris*	YT	Noxious (Provincially)
	Number of Species		3
	Number of Sites		1
	Total Area (m^2)		3

Desktop studies identified one plant species of concern with medium potential to occur within the study area (**Table 3.101**). No plant species have mapped CDC occurrences or federally-designated critical habitat polygons within or overlapping the study area. Seven at-risk ecological communities occur within the BEC subzones overlapped by the study area (DataBC, 2018). None of these at-risk ecological communities have mapped CDC occurrences within the study area (DataBC 2018) (**Table 3.101**).

Table 3.101 Plant Species of Concern and At-Risk Ecological Communities with Potential to Occur in the ELK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	Potential to Occur*
Vascular Plants						
Whitebark pine	*Pinus albicaulis*	1-E (Jul 2012)	E (Apr 2010)	Blue	-	Medium
Ecological communities						
Scrub birch / water sedge	*Betula nana / Carex aquatilis*	-	-	Blue	Yes	X
Slender sedge / common hook-moss	*Carex lasiocarpa / Drepanocladus aduncus*	-	-	Blue	Yes	X
Rough fescue - (bluebunch wheatgrass) - yarrow - clad lichens	*Festuca campestris - (Pseudoroegneria spicata) - Achillea borealis - Cladonia* spp.	-	-	Red	Yes	X
Idaho fescue - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Eriogonum umbellatum - Eremogone capillaris*	-	-	Red	Yes	X
Idaho fescue - bluebunch wheatgrass - sulphur buckwheat - thread-leaved sandwort	*Festuca idahoensis - Pseudoroegneria spicata - Eriogonum umbellatum - Eremogone capillaris*	-	-	Blue	Yes	X
Drummond's willow / bluejoint reedgrass	*Salix drummondiana / Calamagrostis canadensis*	-	-	Blue	Yes	X
Hard-stemmed bulrush Deep Marsh	*Schoenoplectus acutus* Deep Marsh	-	-	Blue	Yes	X

***Notes**: The potential for at-risk ecological communities to occur within the study area was not ranked.
"X" indicates that a community can be found within BEC subzones present within the study area.

3.11.5 Wildlife

The ELK LTL 168 study area does not overlap with any mapped bald eagle or osprey nests, IBAs, or provincial approved WHAs or WMAs (BirdLife International et al. 2018, DataBC 2018, WiTS 2018). Portions of the study area is located within an approved UWR (# U-4-006) for elk and mule deer. The proposed location of the PRS Station (Site #24) is located just outside of the polygon for the UWR (DataBC, 2018). During the PFR, field crews identified an active osprey nest on a nesting platform adjacent to the RoW (**W003, Figure KO-133**). No other observations of wildlife of concern or wildlife habitat features were recorded along the lateral, including at the proposed location of the PRS station (Site #24).

Wildlife habitat present within much of the study area has been modified because of mining activity. Nevertheless, the stands of mixed forest and grassy areas present on the west side of the lateral may provide foraging and nesting habitat for wildlife, including species of concern.

Desktop studies identified 14 wildlife species of concern with medium or high potential to occur within the study area (**Table 3.102**). One of these species has a mapped CDC occurrence within the study area (**Table 3.103**). None of these species have federally-designated critical habitat polygons within the study area (DataBC 2018). Similarly, desktop studies did not identify and mapped masked (i.e., confidential) CDC occurrences within the study area (DataBC 2018).

Table 3.102 Wildlife of Concern with Medium or High Potential to Occur in the ELK LTL 168 Study Area

English Name	Scientific Name	SARA	COSEWIC	BC List	OGC High Priority Wildlife List	*Wildlife Act* Section 34b	Potential to Occur
Mammals							
American Badger	*Taxidea taxus*	1-E (Jun 2018)	E (Nov 2012)	Red	Yes	-	High
Elk	*Cervus elaphus*	-	-	Yellow	Yes	-	High
Little Brown Myotis	*Myotis lucifugus*	1-E (Dec 2014)	E (Nov 2013)	Yellow	-	-	High
Moose	*Alces americanus*	-	-	Yellow	Yes	-	Medium
Mule Deer	*Odocoileus hemionus*	-	-	Yellow	Yes	-	High
White-tailed Deer	*Odocoileus virginianus*	-	-	Yellow	Yes	-	High
Birds							
Barn Swallow	*Hirundo rustica*	1-T (Nov 2017)	T (May 2011)	Blue	-	-	High
Common Nighthawk	*Chordeiles minor*	1-T (Feb 2010)	SC (May 2018)	Yellow	-	-	High
Olive-sided Flycatcher	*Contopus cooperi*	1-T (Feb 2010)	SC (May 2018)	Blue	-	-	High
Osprey	*Pandion haliaetus*	-	-	Yellow	-	Yes	High
Amphibians							
Western Toad	*Anaxyrus boreas*	1-SC (Jan 2005)	SC (Nov 2012)	Yellow	Yes	-	High
Invertebrates							
Gillette's Checkerspot	*Euphydryas gillettii*	-	-	Red	Yes	-	Medium
Vivid Dancer	*Argia vivida*	-	SC (May 2015)	Blue	Yes	-	Medium

Table 3.103 Wildlife of Concern with Mapped CDC Occurrences in the ELK LTL 168 Study Area

English Name	Mapped CDC Occurrences		
	Distance from Lateral (m)	Occurrence Overlap with Study Area (m^2)	Comments
American Badger	Overlap	2,277,710	There are 181 recorded observations of live, dead and road-killed American Badgers in the Elk Valley. The last observation was in 2010 and included 23 kits

4.0 REGULATORY OVERVIEW

This section provides an overview of the environmental legislation, regulations, and bylaws that apply to the Project. A list of environmental permits and approvals that are expected to be required for each lateral is provided in the Project Risk Assessment section for that lateral (**Section 5.0**).

4.1 Federal Legislation

4.1.1 Fisheries Act

Section 35 of the *Fisheries Act* (2012) requires that "*no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery*". Serious harm is defined in the *Act* as, "*the death of fish or any permanent alteration to, or destruction of, fish habitat*". Projects "*can proceed only if there is a low likelihood and low uncertainty regarding both the death of fish and a net negative residual impact on* [fish] *habitat, prior to considerations of any offsetting activities*" (DFO 2014). Proponents must avoid or mitigate serious harm to fish. If serious harm cannot be avoided or mitigated, the Project would require an authorization under sub-Section 35(2) of the *Fisheries Act*. Other sections of the *Fisheries Act* that are applicable to the Project include Section 36(3) that prohibits the deposition of deleterious substances to waters frequented by fish, and Sections 38(4) and 38(5) that require a contravention of either Sections 35 or 36(3) be reported without delay.

4.1.2 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (SC 1994, c.22) protects various species of migratory birds including gamebirds, insectivorous birds, and non-gamebirds. This Act restricts the possession of live and dead migratory birds and bird parts and prohibits the taking of migratory bird nests and the deposit of harmful substances in waters or areas frequented by migratory birds. The provincial *Wildlife Act* described in (**Section 4.2.7**) encompasses most bird species not covered under the *MBCA*.

4.1.3 Species at Risk Act

The primary objective of the *Species at Risk Act* (SC 2002, c. 29) is to prevent species at risk from becoming extirpated or extinct, and to ensures appropriate management of species of special concern to prevent them from becoming threatened or endangered (Government of Canada 2002). Under SARA, protection is afforded to individuals, residences, and in some cases federally-designated critical habitat of species listed in Schedule 1 as "endangered", "threatened" or "extirpated". Some of the study areas for the Project overlap with federally-designated critical habitat; further details are provided in the Overview of Existing Environment sections for each alignment (**Section 3.0**).

Section 73 permits are required by anyone conducting activities that may violate SARA prohibitions by intentionally or inadvertently killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling or trading of individuals of endangered, threatened and extirpated species listed in Schedule 1 of the Act. The Act also contains a prohibition against the damage or destruction of residences (e.g., nest or den) of species listed on Schedule 1 of SARA. The Species at Risk Public Registry (Government of Canada 2018) outlines that Section 73 permits would be required where a violation to the prohibitions of SARA are anticipated for listed species that are:

- Found on federal lands in a province, or on lands in a territory under the authority of the Minister of the Environment or of the Parks Canada Agency

- Migratory birds protected by the MBCA, anywhere they occur, including private lands, lands in a province and lands in a territory
- Aquatic species anywhere they occur, including private lands, lands in a province and lands in a territory

SARA (Section 58) also contains a prohibition against destroying any part of the critical habitat of any listed endangered or threatened species, or of any listed extirpated species if a recovery strategy has recommended its reintroduction, if the:

- Critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada
- Listed species is an aquatic species
- Listed species is a species of migratory birds protected by the MBCA

4.2 Provincial Legislation (British Columbia)

4.2.1 *Oil and Gas Activities Act*

The BC *Oil and Gas Activities Act* (SBC 2008, c. 36) (OGAA) sets out a regulatory framework under which the Oil and Gas Commission (OGC) governs oil and gas activities within the province. The OGAA was brought into effect to consolidate and modernize the requirements that previously existed for oil and gas projects under several acts and regulations. Section 8 of the OGAA gives the Oil and Gas Commission power to make decisions under several pieces of other provincial legislation instead of the statutory decision maker with the mandate to implement that legislation. Under existing legislation, which consists of the OGAA itself and several regulations passed under the Act, the OGC has an established structure for the protection of environmental resources, and a range of compliance and enforcement abilities.

The Environmental Protection and Management Regulation (EPMR), which applies to surface Crown land, provides the OGC with the authority to manage and protect environmental values on provincial Crown land. Key environmental values that require management and protection are identified as Government's Environmental Objectives under Part 2 of the EPMR.

4.2.2 BC Environmental Management Act

The BC *Environmental Management Act* (SBC 2003, c. 53) provides requirements for the regulation of activities that introduce waste into the environment, store special waste, and treat or recycle special waste. This Act establishes the Contaminated Site Regulation (CSR), Hazardous Waste Regulation (Government of BC 1988), Clean Air Provision, the Spill Reporting Regulation (Government of BC 1990), and the Oil and Gas Waste Regulation (Government of BC 2005) and provides a permitting system to enable the authorized disposal of solid waste (including soil), discharge of emissions, and discharge of waste water (including hydrostatic test water), and surface run-off.

Part 8 of the CSR (including the most recent amendments to the EMA under B.C. Reg. 196/2017, October 31, 2017) identifies the requirements for contaminated soil relocation when considering the receiving site. If the industrial use standards, or applicable standards of the receiving site are exceeded, the soil is considered contaminated and a Contaminated Soil Relocation Agreement or disposal at a permitted facility will be required. As such, if suspect contaminated soil is encountered during trenching / construction and needs to be removed from site (e.g., for geotechnical reasons), characterization will be required to ensure relocation is completed appropriately.

4.2.3 *Land Act*

The *Land Act,* RSBC 1996 c. 245) is the primary legislation used by government to permit the use of Crown land by communities, industry and businesses. The Act allows the granting of land, and the issuance of Crown land tenure in the form of leases, licences, permits and rights-of-way.

Section 8 of the OGAA allows the OGC to administer the following sections of the *Land Act:* Section 11 (disposing of Crown land), Section 14 (temporary occupation of Crown land), section 38 (lease of Crown land), Section 39 (licence of occupation), Section 40 (right of way and easement), and Section 96 (occupational rental).

4.2.4 *Agricultural Land Commission Act*

The BC *Agricultural Land Commission Act* (SBC 2002, c. 36) sets the legislative framework for the establishment and administration of the agricultural lands preservation program. The Act is meant to protect agricultural land within the province. Under the Act, this land is designated as ALR.

The Agricultural Land Commission (ALC) is the agency responsible for the administration of the ALR. The OGC has a delegation agreement with the ALC that gives the OGC authority to permit oil and gas activities in the ALR. Land must be reclaimed to its pre-development agricultural condition when no longer required for an oil or gas activity.

4.2.5 *Water Sustainability Act*

The BC *Water Sustainability Act* (SBC 2014, c. 15) (WSA) is the principal legislation for managing the diversion and use of water resources. Section 8 of the OGAA allows the OGC to administer both Sections 10 and 11 of the WSA, including issuing change approvals and use approvals.

For changes in and about a stream, an application for a Change Approval or submission of a Notification is required under Section 11 of the *WSA*. Under the WSA, a stream is defined as "(*a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the channel of the stream has been modified, or (b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland or glacier, whether or not usually containing water, including ice, but does not include an aquifer".*

Changes in and about a stream are defined in the WSA as:

- Any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream
- Any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel.

4.2.6 *Forest and Range Practices Act*

The *Forest and Range Practices Act* (SBC 2002 c. 69) (FRPA) outlines how forest and range practices and resource-based activities are to be conducted on Crown land. It also addresses the protection of plants, animals and ecosystems while undertaking these resource-based activities.

Forestry and range land use management guidelines for wildlife are established by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development under FRPA. Under FRPA and the Government Actions Regulations (Government of BC 2004), ungulate winter ranges, general wildlife measures, and wildlife habitat areas can be established for specified areas and for specified species to set objectives with respect to acceptable forest and range practices in these areas.

4.2.7 *Wildlife Act*

In general, the BC *Wildlife Act (*RSBC 1996, c. 488*)* provides a regulatory framework for the management of wildlife and, in very limited circumstance and limited to a few specifically designated species, wildlife habitat (i.e., bird nests) in the province. The *Wildlife Act* protects most native vertebrates from direct harm or harassment, regulates hunting, trapping and sport fishing, protects nesting birds and active nests that are occupied by a bird or its egg(s). The nests of some bird species are afforded specific consideration under Section 34b of the *Wildlife Act* regardless of whether they are occupied. These protected nests include those used seasonally by peregrine falcon, burrowing owl, bald eagle, osprey, and great blue heron as relevant to this project.

A general Wildlife Act permit is required for any trapping or handling of live wildlife (i.e., salvages), including species at risk.

4.2.8 *Weed Control Act*

The BC *Weed Control Act*, RSBC 1996, c.487, aims to control the spread of designated noxious plants on all provincial Crown and private land. There is an obligation under the *Act* for the land occupier to control these designated noxious plants. The *Act* requires all land occupiers to avoid establishment and dispersal of noxious weeds as defined by the *Act*.

4.2.9 *Riparian Areas Protection Act*

The *Riparian Areas Protection Act* (SBC 1997 c. 21) and associated Riparian Areas Regulation (RAR) direct local governments to protect riparian areas during new residential, commercial and industrial development. Local governments must either include riparian area protection provisions in its zoning bylaws and permits in accordance with the RAR or ensure that its bylaws and permits meet or exceed the RAR. The RAR applies only to the regional districts specified in Section 3 of the regulation, which does not include the Project area.

4.3 Regional Bylaws

4.3.1 Central Kootenay Regional District

Soil Removal and Deposit Permit Bylaw No.1183 (Electoral Areas ‘I’ and ‘J- Lower Arrow/Columbia’), 1996

The Regional District’s Soil Removal and Deposit bylaw applies to lands within Electoral Areas ‘I’ and ‘J - Lower Arrow/Columbia’ which include the lands surrounding Castlegar and Nelson. These Electoral Areas are designated as Soil Removal and Deposit permit areas and, as such, no person shall remove soil from or deposit soil or other material without first obtaining a permit from the Regional District.

Watercourse Development Area Electoral Area 'E' Rural, Official Community Plan Bylaw No. 2260, 2013

Within the Electoral Area 'E' OCP, Watercourse Development Permit (WDP) Areas have been identified where Development Permits are required for various activities including removal or alteration of vegetation, soil disturbance, construction of buildings or structures and development of utility corridors. The WDPs are comprised of Riparian Assessment Areas per the RAR Implementation Guidebook (BC MOE 2006). These areas include the area within 15 m of the high water mark of a watercourse; within 15 m of the top of the ravine bank in the case of a ravine less than 60 m wide; and within 5 m of the top of the ravine bank in the case of a wider ravine that link aquatic to terrestrial ecosystems (BC MOE 2006).

4.3.2 Regional District of Kootenay Boundary

No applicable bylaws were identified for the Regional District of East Kootenay.

4.3.3 Regional District of East Kootenay

No applicable bylaws were identified for the Regional District of East Kootenay.

4.4 Municipal Bylaws

4.4.1 City of Castlegar

Official Community Plan Bylaw No. 1150, 2011

According to the City of Castlegar (City) OCP, approval may be required for development that may result in impacts to the natural environment. As such, studies (e.g., an environmental impact assessment) may be required for approval from the City.

Sewer Regulation and Rates Bylaw No. 1260, 2018

Per the Sewer Regulation and Rates Bylaw, no person shall discharge or cause to be discharged into any part of the Sanitary Sewer System, without a permit from the City: any storm drainage, except as permitted in the case of a Combined System; or any Prohibited Waste per Schedule "A". Prohibited waste includes wastewater with a pH lower than 6.5 and higher than 9.0, wastewater containing suspended solids at concentrations above the guidelines listed in the OCP or turbid wastewater exceeding the guidelines listed in the OCP and the provincial Water Quality Guidelines. Schedule "A" of the bylaw also includes prohibitions, such as discharge of prohibited waste into the municipal stormwater system and watercourses.

4.4.2 City of Nelson

Municipal Tree Bylaw No. 3232, 2012

The City of Nelson Tree Bylaw states that no person other then an employee or authorized contractor of the Operations Department shall prune, cut, deface or remove any tree on any property owned or managed by the City without first having obtained a valid Tree Cutting Permit signed by the Director of Operations. It is expected that the Project will require a tree cutting permit prior to construction.

The City of Nelson Official Community Plan Bylaw No 3247, 2013

Any proposed construction, soil removal, and impermeable paving surfaces should be avoided within 15 m from high water mark of any watercourse, lake and wetland. Any new construction, soil removal, and impermeable paving surfaces within 15 m from the high-water mark are required to be assessed by a Registered Professional Biologist and reviewed by DFO. A drainage plan will also be required to minimize the impact to riparian habitat.

The City of Nelson Sanitary Sewer Regulatory Bylaw No. 3351, 2017

As per the Sanitary Sewer Regulatory Bylaw, no person shall discharge or cause to be discharged into any part of the sanitary sewer system, without a permit from the city: any storm drainage, except as permitted, or any Prohibited Waste. The definition of Prohibited Waste includes parameters set out to define wastewater based on pH, suspended solids, turbidity and chloride.

4.4.3 District Municipality of Sparwood

Riparian Protection Development Permit Area Official Community Plan Bylaw No. 1165

According to the District's OCP, land identified within the Riparian Protection Development Permit Areas must not be altered, nor shall construction of, additions to or alteration of a building or other structure be commenced within the permits areas without a Development Permit. Development permit areas are intended to minimize adverse impacts to riparian areas. To achieve this, the OCP includes guidelines and best management practises for working within Riparian Protection Development Permit Areas. The OCP also sets minimum riparian setback distances for the Elk River (and its tributaries), as well as Michel, Alexander, Bodie, Cummings, Erickson, and Summit creeks and Summit Lake.

Utility and Solid Waste Management Bylaw 1014, 2009

The Utility and Solid Waste Management Bylaw addresses discharge to the sanitary and storm sewer system within the District boundaries. Pursuant to the bylaw, no person shall discharge, or permit to be discharged, prohibited waste into the storm system. These include high temperature wastewaters, pH waste, and suspended solids. In addition, no person shall discharge, or permit to be discharged, into the sanitary sewer system prohibited wastes such as high temperature wastewater and storm drainage, as well as other restricted wastes listed in the bylaw.

4.4.4 District Municipality of Elkford

Riparian Areas Development Permit Area, Official Community Plan Bylaw No. 710, 2010

A Riparian Areas Development Permit is required for lands adjacent to watercourse as identified in Schedule C of the OCP and includes the Elk River and the Boivin Creek. Development permits set forth conditions that must be met during development activities. Pursuant to the OCP, no development or alteration of vegetation shall take place:

- For a stream, within a 30 m strip on both sides of the stream measured from the natural boundary
- For a ravine less than 60 m wide, within a strip on both sides of the stream measured from the high-water mark to a point that is 30 m beyond the top of the ravine

- For a ravine 60 m wide or greater, within a strip on both sides of the stream measured from the natural boundary to a point that is 10 m beyond the top of the ravine bank
- For all identified wetland and riparian aquatic ecosystems, within a 30 m leave strip or buffer area extending from the high-water mark

These setbacks can be reduced by the District subject to the submission of a report prepared by a Qualified Environmental Professional (QEP) that addresses compliance with the applicable provincial and federal legislation.

Sanitary Sewer and Storm Drainage Bylaw No. 779, 2016

Pursuant to the Sanitary Sewer and Storm Drainage Bylaw no person shall discharge, or allow or cause to be discharged, into the storm drainage system any substance except stormwater, and water resulting from the provision of municipal services such as street flushing, fire extinguishing activities and from activities such as lawn watering and car washing. In addition, no person shall place or deposit into or near any intake to the storm drainage system or by action or neglect, cause or allow the entry into any intake of the storm sewer system of any prohibited water such as oil and grease and or contaminated waters as defined under the bylaw.

4.4.5 City of Cranbrook

Natural Environment and Hazardous Conditions Areas, City of Cranbrook Official Community Plan, Bylaw No. 3550, 2008

According to the City of Cranbrook's Official Community Plan (OCP), development within an Environmentally Sensitive Areas as identified on Schedule C3 require an Environmentally Sensitive Area Development Permit prior to development; riparian areas are considered Environmentally Sensitive Areas. New development in a riparian area may occur only in accordance with consideration of the recommendations within an Environmental Impact Study, provided that most of riparian values on the subject lands are preserved. To protect riparian environmental values, up to a 45 m buffer may be required from the natural boundary of all water bodies. This buffer is to be determined through the Environmental Impact Study. In addition, the removal of trees, natural vegetation, soil or other alterations of the land and water are not permitted in theses areas without a Development Permit.

Erosion and Sediment Control Bylaw No. 3692, 2010

The Erosion and Sediment Control bylaw states that no person shall cause or permit another person to cause, sediment or sediment laden water to be discharged, either directly or indirectly, into the City's drainage system. In addition, no person shall discharge, either directly or indirectly, water with turbidity greater than 25 NTU, or as indicated by current guidelines, into the City's drainage system. An ESC Permit is required for all construction projects within the City. For construction sites where an ESC permit has been issued no person shall discharge, either directly or indirectly, water with turbidity greater than 25 NTU into the City's drainage system unless a significant rainfall event has occurred. Following a significant rainfall event, no person shall discharge either directly or indirectly, water with turbidity greater than 100 NTU.

4.4.6 City of Kimberley

Environmental Protection Development Permit Area # 5, City of Kimberley Official Community Plan, 2017

According to the City's Official OCP all development, including disturbance to or removal of soils, water trees and other vegetation, within the environmental protection area is prohibited unless a development permit has been issued, unless specifically exempt. In addition, an Environmental Impact Study may be required to determine potential impacts and mitigation measures (City of Kimberley 2017). The OCP goes on to outline guidelines for working within Development Permit Area #5 including the installation of ESC measures, construction within timing windows for sensitive species and riparian planting following construction.

Tree Cutting Bylaw No. 2170, 2002

According to the City's Tree Cutting bylaw no person shall cut, remove or damage or allow to be cut, removed or damaged on any property in a tree cutting permit areas without obtaining a permit prior to undertaking the work.

4.4.7 City of Trail

Waterworks and Sanitary Sewer Regulation Bylaw No. 2398, 1998

Pursuant to the City's bylaw, no person shall discharge or cause or allow to be discharged into the sewer system any storm waters, surface water, ground water, roof run-off or surface drainage or any waters, sewage or wastes having a pH factor lower than 5.0 or higher than 9.5. In addition, no person shall discharge into any ditch, drain, creek, stream or water course, any sanitary sewerage, other waters, industrial wastes, petroleum products, coal tar, or any refuse or substance arising from the manufacture or processing of gas or petroleum or other material and products without first obtaining written permission to do so from the Manager and the Medical Health Officer.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS AND RISKS

This section provides a high-level overview of the potential negative impacts to environmental receptors that may result from Project construction. Environmental sensitivities were identified where sensitive features associated with an environmental receptor are anticipated to be directly impacted by construction activities[6] (i.e., where the anticipated construction footprint overlaps with identified features), and where factors present a risk to the Project. For the purposes of this report, risks to the Project include additional costs (e.g., activities requiring further follow-up work or mitigation), timing constraints (e.g., species-specific timing windows) or both (e.g., permits or approvals).

Potential Project risks are identified and ranked for land use, surface water quantity and quality, fish and fish habitat, vegetation (including species at risk), wildlife (including species at risk), and contaminated soils and/or groundwater. This represents an expanded list of environmental receptors compared to those considered in the Overview of the Existing Environment (**Section 3.0**), as surface water quantity and quality are also included. These environmental receptors were grouped into two categories as follows:

1. **Biophysical receptors:**
   - Land use:
     - Presence and potential disturbance to parks and protected areas
     - Presence and potential disturbance of ALR, with consideration to agricultural capability of soils
   - Surface water quantity and quality:
     - Presence of surface water, and potential for contamination or modification to surface water flow
   - Fish and fish habitat:
     - Presence of and potential disturbance and modification of fish habitat
   - Vegetation:
     - Presence and potential for spread of invasive vegetation
     - Presence and potential disturbance to areas of natural vegetation
     - Presence and potential for disturbance to plant species and communities of concern
   - Wildlife and wildlife habitat:
     - Presence and potential disturbance of wildlife of concern and wildlife habitat features
     - Presence of designated critical habitat
2. **Contaminated Soils/Groundwater:**
   - Risk Areas along each lateral were there is a medium or high risk of soil and/or groundwater contamination present and intrusive work (i.e., ground disturbance) is recommended to confirm the presence and extent of the contamination. These areas are considered to pose a risk to the Project during construction activities related to soil and groundwater management. The list of Risk Areas for each lateral was further refined by removing identified APECs where contaminated soil, if encountered, will likely be reused as fill or spread within the ROW, resulting in a reduced risk to the Project

[6] For laterals with ILI as the alternative upgrade option, overlap of sensitive features

Follow-up activities are recommended to address or mitigate risks associated with each receptor. Additionally, a separate list of permits and approvals that are expected to be required, along with the estimated timeframe for issuance, is provided for the preferred and alternate upgrade option of each lateral.

5.1 CEL LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.1.3**.

5.1.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.1**.

Table 5.1 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CEL LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• None identified	• None anticipated	Nil	• None required	• Construction zones that overlap with ALR land • Construction footprint overlaps with Arrow Lakes Drive, the only access road to the Interfor Mill	• Temporary or permanent impact on soils and agricultural capacity of properties within the Project footprint during construction • Potential challenges to construction access and timing related to industrial and railway use	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Interfor Mill
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• One watercourse crosses the alignment or overlaps the anticipated construction area (KO_CEL LTL 168_007)	• Temporary diversion of surface water • Introduction of deleterious substances into surface water (e.g., sediment andconstruction debris) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• There is no fish habitat that overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• One watercourse or riparian area (considered fish habitat) crosses the alignment or overlaps the anticipated construction area (KO_CEL LTL 168_007)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish or macroinvertebrates • Loss of food and nutrient contribution	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• None identified	• Permanent loss of vegetation (mainly grass and small shrubs) within the footprint of the PRS (Site #16)	Nil	• Develop and implement an EMP and conduct environmental monitoring • Site restoration	• Areas of mature/sensitive native vegetation (including riparian vegetation) near proposed construction areas	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include ground nests that may be present in the vicinity of the PRS (Site #16) • PRS Site #16 overlaps UWR (# U-4-001) and WHA (8-373) for grizzly bear	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP including considerations for compying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern that overlap with the study area: • Lewis's Woodpecker • Construction areas overlap UWR (# U-4-001) and WHA (8-373) for grizzly bear	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • Where practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.1.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.2**.

Table 5.2 Summary of Project Risk Areas – Contaminated Soil and/or Groundwater Investigation Recommended for CEL LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CEL LTL 168 (ILI)						
No Risk Areas Identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.1.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.3 Regulatory Approvals and Timelines for CEL LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	No
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	No
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Likely
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	No
	Watercourse Development Permit		No	No
City of Castlegar	Discharge Permit	Up to 2 months	No	Yes

5.2 CAS NEL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.2.3**.

5.2.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.4**.

Table 5.4 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CAS NEL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• PRS Station is adjacent to Columbia Avenue, a collector road on the south side of Castlegar	• Potential challenges to construction access and timing related to traffic on Columbia Avenue	Low	• Public Engagement	• Construction zones within Millennium Park and on or near trails associated with Morning Mountain Trail Area • Construction zones that overlap with ALR land • Construction zones immediately adjacent to CPR tracks and Highway 3A	• Temporary disruption of recreational use at Millennium Park and Morning Mountain Trail Area • Temporary or permanent impact on soils and agricultural capacity of properties overlapped by the Project during construction • Potential challenges to construction access and timing related to railway and highway use	High	• Public engagement • Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with CPR and Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 10 waterbodies cross the alignment or overlap the anticipated construction area (KO_CAS LTL 168_004, 005, 009, 013, 020 023, 024, 046 to 048)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• There is no fish habitat that overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 15 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CAS LTL 168_004, 005, 009, 013, 020 023, 024, 035 to 038, 041, 046, 047, 048)	• Temporary modification of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• None identified	• No adverse effects anticipated	Nil	• N/A	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction areas • Two species of concern with historic mapped occurrences that overlap with construction areas (Heterocodon and Monardella) and one with known occurrence near construction area (Howell's quillwort)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern	Medium	• Areas of mature/sensitive native vegetation near proposed construction areas • 57 sites of invasive vegetation near the lateral • 2 species of concern with historic mapped occurrences that overlap with construction areas

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near the location of the PRS • Proposed PRS station is overlapped by UWR #0-4-001 and WHA 8-373 for grizzly bear	• Disturbance of wildlife using nearby wildlife features that may be present near the proposed PRS location during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near proposed construction areas, including those identified during the PFR: ▫ Unidentified stick nest (W003) • Construction zones overlapped by critical habitat for Lewis' woodpecker (bend zones 0+895 and 1+250) ▫ The exact location of bend zone at 0+895 was not accessible during PFR; however, based on aerial imagery of this site, and field photos of 1+250, areas defined as critical habitat are anticipated to present in these areas, including suitable nest trees and foraging habitat • Construction zones overlapped by critical habitat for caribou ▫ Areas defined as critical habitat may be present in these areas, including forest stands with cedar, hemlock, and spruce (ECCC 2014) • Construction zones overlapped by UWR #0-4-001 and WHA 8-373 for grizzly bear	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration or destruction of critical habitat within identified polygons	High	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features • Conduct detailed follow-up assessments to determine if critical habitat features or attributes for caribou are present or near known areas of disturbance

5.2.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.5**.

Table 5.5 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CAS NEL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CAS NEL 168 (PRS)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.2.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.6 Regulatory Approvals and Timelines for CAS NEL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	Likely (Lewis's woodpecker)
OGC	Waste Discharge Authorization	3-6 months	No	No
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Likely
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Likely
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	No
	Watercourse Development Permit		Yes	Likely
City of Castlegar	Discharge Permit	Up to 2 months	Yes	Yes
City of Nelson	Discharge Permit	Up to 2 months	Yes	Yes

5.3 TRA LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.3.1** and **5.3.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.3.3**.

5.3.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.7**.

Table 5.7 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with TRA LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• None identified	• None anticipated	Nil	• None	• Construction areas immediately adjacent to Highway 22	• Potential challenges to construction access and timing related to highway use	Low	• Engagement with Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 1 waterbody crosses the alignment or overlaps the anticipated construction area (KO_TRA LTL 168_001, 002)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• There is no fish habitat that overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 2 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_TRA LTL 168_001, 002)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• None identified	• No adverse effects anticipated	Nil	• N/A	• Areas of mature/sensitive native vegetation near proposed construction areas • Four sites of invasive vegetation near the lateral • Three species of concern with historic mapped occurrences that overlap lateral (Blunt-sepaled star-wort, long-leaved aster, and tall bluebells)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities

Environmental Receptor	Preferred Option (PRS)				Alternative Option (ILI)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near the location of the PRS • Proposed PRS station is overlapped by UWR #0-4-001 and WHA 8-373 for grizzly bear	• Disturbance of wildlife using nearby wildlife features that may be present near the location of the PRS during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near the location of the PRS • Construction zones overlapped by UWR #0-4-001 and WHA 8-373 for grizzly bear	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	High	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.3.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.8**.

Table 5.8 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for TRA LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
TRA LTL 168 (PRS)						
T1	FortisBC pump station – Site Registry entry noting mercury contamination (250m north of Bingay Road, Trail)	Mercury	On-Site	High	20	KO-031
T6	Trail smelter facility – Teck Cominco (east of Aldridge Avenue, Trail)	Metals	115 m east	Medium	90	KO-031

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.3.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.9 Regulatory Approvals and Timelines for TRA LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (ILI)
DFO	Request for Project Review	2-3 months	No	No
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	Unlikely
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	No
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Likely
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Unlikely
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	No
	Watercourse Development Permit		No	No

5.4 KBY LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.4.1** and **5.4.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.5.3**.

5.4.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.10**.

Table 5.10 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with KBY LTL 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones located in ESA in Cranbrook and EPDPA in Kimberly • Construction zones overlapping ALR land • Construction zones overlapping Highway 95A	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to highway use	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure	• Construction zones located in ESA in Cranbrook and EPDPA in Kimberly • Lateral overlapped by ALR land • Lateral crosses Highway 95A	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to highway use	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• 2 waterbodies cross the alignment or interact with the anticipated construction area (KO_KBY LTL 168_008, 010)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 4 waterbodies cross the alignment or overlap the anticipated construction area (KO_ KBY LTL 168_001, 008, 010, 011)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• 2 waterbodies or riparian areas (considered fish habitat) cross the alignment or interact with the anticipated construction area (KO_KBY LTL 168_008, 010)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 4 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_ KBY LTL 168_001, 008, 010, 011)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Six species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort, hairstem groundsmoke, prairie gentian, prairie golden bean, scarlet guara, and spurless touch-me not)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• Areas of mature/sensitive native vegetation near proposed construction areas • 56 sites of invasive vegetation near the lateral • Six species of concern with historic mapped occurrences that overlap the lateral (dainty moonwort, hairstem groundsmoke, prairie gentian, prairie golden bean, scarlet guara, and spurless touch-me not)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern overlapping or near construction zones, including ▫ American badger ▫ Lewis's woodpecker ▫ Sharp-tailed grouse • Area where construction footprint overlaps with critical habitat of caribou ▫ Areas defined as critical habitat may be present in these areas, including forest stands with hemlock • Area where construction footprint overlaps with critical habitat of Lewis's woodpecker ▫ Areas defined as critical habitat are anticipated to present in these areas, including suitable nest foraging habitat in the vicinity of known or potential nesting trees • Construction areas overlap UWR # U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration or destruction of critical habitat within identified polygons	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conduct a more thorough follow-up assessments to determine if critical habitat features or attributes of caribou and Lewis's woodpecker are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near lateral including those identified during the PFR: • Suspected American badger den (W001) • Known occurrences of species of concern overlapping or near construction zones, including ▫ American badger ▫ Lewis's woodpecker ▫ Sharp-tailed grouse • Area where construction footprint overlaps with critical habitat of caribou ▫ Areas defined as critical habitat may be present in these areas, including forest stands with hemlock • Area where construction footprint overlaps with critical habitat of Lewis's woodpecker ▫ Areas defined as critical habitat are anticipated to present in these areas, including suitable nest foraging habitat in the vicinity of known or potential nesting trees • Construction areas overlap UWR # U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration or destruction of critical habitat within identified polygons	High	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conduct detailed follow-up assessments to determine if critical habitat features or attributes of caribou and Lewis's woodpecker are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.4.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.11**.

Table 5.11 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for KBY LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
KBY LTL 168 (ILI)						
Y1/Z1	Kootenay Wood Preservers (4201 Echo Field Road, Cranbrook)	Total chlorinated phenols, metals	On-Site	High	125	KO-043
Z3	Former Kimberley municipal landfill and current municipal transfer station (Fertilizer Road, Kimberley)	BTEX/VPH, EPH, PAHs, PCBs, VOCs, chlorinated and non-chlorinated phenols, metals	On-Site	High	40	KO-032 and KO-033

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.4.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.12 Regulatory Approvals and Timelines for KBY LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	Likely	Yes
ECCC	Section 73 Permit	3 months	Likely (Lewis's woodpecker)	Likely (Lewis's woodpecker)
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Likely	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		No	Yes
City of Cranbrook	Environmentally Sensitive Area Development Permit	Up to 2 months	Yes	Yes
	ESC Permit		Yes	Yes
City of Kimberly	Environmental Protection Development Permit	Up to 2 months	Yes	Yes
	Tree cutting permit		Likely	Yes

5.5 CRK LP2 219 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.5.1** and **5.5.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.5.3**.

5.5.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.13**.

Table 5.13 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CRK LP2 219

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones within an ESA • Construction zones overlapping ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities	• Lateral crosses ESA • Lateral is overlapped by ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities
Surface Water Quality and Quantity	• 1 waterbody crosses the alignment or overlaps the anticipated construction area (KO_KBY LTL 168_010)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 2 waterbodies cross the alignment or overlap the anticipated construction area (KO_KBY LTL 168_010, 011)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• 1 waterbody or riparian area (considered fish habitat) crosses the alignment or overlaps the anticipated construction area (KO_KBY LTL 168_010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 2 waterbodies or riparian habitats (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_KBY LTL 168_010, 011)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and hairstem groundsmoke)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• Areas of mature/sensitive native vegetation near proposed construction areas • Eight sites of invasive vegetation near the lateral • Two species of concern with historic mapped occurrences that overlap the lateral (dainty moonwort and hairstem groundsmoke)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern overlapped by construction zones, including ▫ American badger • Area where construction footprint overlapped by federally-designated critical habitat polygons of caribou ▫ Area defined as critical habitat may be present in these areas, including forest stands with hemlock • Construction areas overlap UWR # U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration of critical habitat within identified polygons	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conduct assessments to determine if critical habitat features or attributes of caribou are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near the lateral • Known occurrences of species of concern overlapped by construction zones, including ▫ American Badger • Lateral overlapped by federally-designated critical habitat polygons of caribou ▫ Areas defined as critical habitat may be present in these areas, including forest stands with hemlock • Lateral overlaps UWR # U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities ▫ Direct injury or mortality resulting from equipment operation ▫ Potential alteration of critical habitat within identified polygons	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conductassessments to determine if critical habitat features or attributes of caribou are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.5.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.14**.

Table 5.14 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CRK LP2 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CRK LP2 219 (ILI)						
Y1/Z1	Kootenay Wood Preservers (4201 Echo Field Road, Cranbrook)	Total chlorinated phenols, metals	Adjacent	Medium	35	KO-043

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.5.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.15 Regulatory Approvals and Timelines for CRK LP2 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	Likely
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Likely	Likely
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Unlikely	Unlikely
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		Likely	Yes
City of Cranbrook	Environmentally Sensitive Area Development Permit	Up to 2 months	Yes	Yes
	ESC Permit		Yes	Yes

5.6 CRK LOP 273 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.5.1 and 5.5.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.5.3**.

5.6.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.16**.

Table 5.16 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CRK LOP 73

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Cranbrook Community Forest and Idlewild Park • Wildstone and Mission Hills Golf Courses • Construction zones within ESA • Construction zones overlapping ALR land • Construction zones that are near Highway 3 and CPR tracks	• Temporary disruption of recreational use at the Cranbrook Community Forest, Idlewild Park, and Wildstone and Mission Hills Golf Courses • Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to highway and railway use	Medium	• Public engagement • Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure and CPR	• Cranbrook Community Forest and Idlewild Park • Wildstone and Mission Hills Golf Courses • Lateral crosses ESA • Lateral is overlapped by ALR land • Lateral crosses Highway 3 and CP Railway tracks	• Temporary disruption of recreational use at the Cranbrook Community Forest, Idlewild Park, and Wildstone and Mission Hills Golf Courses • Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to highway and railway use	High	• Public engagement • Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with Ministry of Transportation and Infrastructure and CPR
Surface Water Quality and Quantity	• 4 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LOP 273_003, 006, 008, 010)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 5 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LOP 273_003, 004, 006, 008, 010))	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• 4 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LOP 273_003, 006, 008, 010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	Medium	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 5 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LOP 273_003, 004, 006, 008, 010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement and EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• Areas of mature/sensitive native vegetation near proposed construction areas • 29 sites of invasive vegetation near the lateral • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement and EMP an conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities
Wildlife	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoringSite restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• Areas of mature/sensitive native vegetation near proposed construction areas • 29 sites of invasive vegetation near the lateral • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present	Medium	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities

5.6.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.17**.

Table 5.17 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CRK LOP 273

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CRK LOP 273 (ILI)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.6.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.18 Regulatory Approvals and Timelines for CRK LOP 273

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	Possibly	Likely
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	Yes	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Yes	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Yes	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		Likely	Yes
City of Cranbrook	Environmentally Sensitive Area Development Permit	Up to 2 months	Yes	Yes
	ESC Permit		Yes	Yes

5.7 CRK LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.7.1** and **5.7.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.7.3**.

5.7.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.19**.

Table 5.19 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CRK LTL 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones overlapping or adjacent to ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Low	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities	• Lateral overlaps ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Low	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities
Surface Water Quality and Quantity	• 3 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_012, 013, 037	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 14 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_002, 003, 012 to 014, 017, 020, 022, 023, 028, 030-US, 031, 036 to 038)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• 5 waterbodies or riparian habitat (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_012, 013, 030-DS, 036, CRK LOP 273_010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 16 waterbodies or riparian habitat (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_002, 003, 012 to 014, 017, 020, 022, 028, 030-US, 030-DS, 031, 035, 036, 038, CRK LOP 273_010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet gaura) • Construction areas outside of the existing RoW that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including areas of natural open parkland and forest openings of suitable size, substrate, and elevation for the species	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons	• Areas of mature/sensitive native vegetation near proposed construction areas • 101 sites of invasive vegetation near the lateral • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet gaura) • Construction areas outside of the existing RoW that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including areas of natural open parkland and forest openings of suitable size, substrate, and elevation for the species	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement an EMP an conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern near construction zones, including: ▫ American badger ▫ Painted turtle • Construction areas overlap UWR (U-4-006) and WHA 4-180	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near lateral, including those identified during the PFR: ▫ Inactive stick nest (W001) that may be re-established in future years • Known occurrences of species of concern near lateral, including: ▫ American badger ▫ Painted turtle • Lateral overlaps UWR (U-4-006) and WHA 4-180	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	High	• Develop and Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.7.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.20**.

Table 5.20 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CRK LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CRK LTL 168 (ILI)						
No Risk Areas Identified.						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.7.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.21 Regulatory Approvals and Timelines for CRK LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		Likely	Yes
City of Cranbrook	Environmentally Sensitive Area Development Permit	Up to 2 months	No	No
	ESC Permit		Yes	Yes

5.8 CRK LOP 219 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in Sections **5.8.1** and **5.8.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.8.3**.

5.8.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.22**.

Table 5.22 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with CRK LOP 219

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones overlapping or adjacent to ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Low	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities	• Lateral overlaps ALR land	• Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction	Low	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities
Surface Water Quality and Quantity	• 3 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_012, 013, 037	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Medium	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 14 waterbodies cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_002, 003, 012 to 014, 017, 020, 022, 023, 028, 030-US, 031, 036 to 038)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• 5 waterbodies or riparian habitat (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_012, 013, 030-DS, 036, CRK LOP 273_010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 16 waterbodies or riparian habitat (considered fish habitat) cross the alignment or overlap the anticipated construction area (KO_CRK LTL 168_002, 003, 012 to 014, 017, 020, 022, 028, 030-US, 030-DS, 031, 035, 036, 038, CRK LOP 273_010)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara) • Construction areas outside of the existing RoW that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including areas of natural open parkland and forest openings of suitable size, substrate, and elevation for the species	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons	• Areas of mature/sensitive native vegetation near proposed construction areas • 102 sites of invasive vegetation near the lateral • Two species of concern with historic mapped occurrences that overlap with construction areas (dainty moonwort and scarlet guara) • Construction areas outside of the existing RoW that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including areas of natural open parkland and forest openings of suitable size, substrate, and elevation for the species	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern if present (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern near construction zones, including ▫ American badger ▫ Painted turtle • Construction areas overlap UWR (U-4-006) and WHA 4-180	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near lateral, including those identified during the PFR: ▫ Inactive stick nest (W001) that may be re-established in future years • Known occurrences of species of concern near lateral, including ▫ American badger ▫ Painted turtle • Lateral overlaps UWR (U-4-006) and WHA 4-180	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	High	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.8.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.23**.

Table 5.23 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for CRK LOP 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
CRK LOP 219 (ILI)						
No Risk Areas Identified.						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.8.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.24 Regulatory Approvals and Timelines for CRK LOP 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Possibly
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Likely	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		Likely	Yes
City of Cranbrook	Environmentally Sensitive Area Development Permit	Up to 2 months	No	No
	ESC Permit		Yes	Yes

5.9 SSK LTL 219 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.9.1** and **5.9.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.9.3**.

5.9.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.25**.

Table 5.25 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with SSK LTL 219

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction zones overlapping ALR land • Construction zones near CP railway tracks	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Potential challenges to construction access and timing related to railway use	Medium	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with CP Rail	• Entire lateral overlaps ALR land • Lateral crosses Highway 95A and CP Railway tracks	• Temporary or permanent impact on soils and agricultural capacity of properties within project during construction • Potential challenges to construction access and timing related to railway and highway use	High	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with CP Rail and Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• There are no waterbodies that cross the alignment or interact with the anticipated construction area	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 6 waterbodies cross the alignment or overlap the anticipated construction area (KO_SKK LTL 168_006, 009, 012, 014, 015, 017)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• There is no fish habitat that crosses or overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• 4 waterbodies or riparian habitat (considered fish habitat) cross the alignment or interact with the anticipated construction area (KO_SKK LTL 168_006, 009, 012, 017)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • Four species of concern with mapped CDC occurrences that overlap with construction areas (hairstem groundsmoke, prairie golden bean, scarlet guara, and spurless touch-me-not) • One construction area within WHA for at-risk ecological community (antelope-bluebrush wheatgrass)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern and at-risk ecological community • Potential disturbance to habitat within the WMA	High	• Develop and implement an EMP, including information on mitigation required for working in antelope-brush/bluebunch wheatgrass WHA, and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• Areas of mature/sensitive native vegetation near proposed construction areas • 27 sites of invasive vegetation near the lateral • Four species of concern with mapped CDC occurrences that overlap the lateral (hairstem groundsmoke, prairie golden bean, scarlet guara, and spurless touch-me-not) • Lateral runs through WHA for at-risk ecological community (antelope-bluebrush wheatgrass)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern and at-risk ecological community • Potential modification or alteration of habitat within the WMA	High	• Develop and implement an EMP, including information on mitigation for working in antelope-brush/bluebunch wheatgrass WHA, and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may be present near construction zones • Known occurrences of species of concern near construction zones, including ▫ American bagger ▫ Lewis's woodpecker ▫ Long-billed curlew ▫ Sharp-tailed grouse • Area where construction footprint overlaps with critical habitat of caribou • Vegetation observed along the alignment (predominantly ponderosa pine and Douglas-fir) are not anticipated to constitute critical habitat features or attributes for this species; however, this should be confirmed with a follow-up assessment • Area where construction footprint overlaps with critical habitat of Lewis's woodpecker	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration or destruction of critical habitat within identified polygons •	High	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • badger den (W001) should be surveyed to confirm use • Conduct follow-up assessments to determine if critical habitat features or attributes of caribou and Lewis's woodpecker are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near lateral, including those identified during the PFR: ▫ Site of western toad observation (W003) • Known occurrences of species of concern near construction zones, including ▫ American bagger ▫ Lewis's woodpecker ▫ Long-billed curlew ▫ Sharp-tailed grouse • Area where lateral overlaps with critical habitat of caribou ▫ Vegetation observed along the alignment (predominantly ponderosa pine and Douglas-fir) are not anticipated to constitute as critical habitat features or attributes for this species, however this should be confirmed with a follow-up assessment • Area where lateral overlaps with critical habitat of Lewis's woodpecker ▫ Areas defined as critical habitat are anticipated to present in these areas, including suitable nest foraging habitat in the	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Potential alteration or destruction of critical habitat within identified polygons	High	• Develop and implement an EMP, including considerations for complying with the measures of the WHA and UWR orders, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Conduct follow-up assessments to determine if critical habitat features or attributes of caribou and Lewis's woodpecker are present in or near known areas of disturbance • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
	▫ Areas defined as critical habitat are anticipated to present in these areas, including suitable nest foraging habitat in the vicinity of known or potential nesting trees • Construction areas overlapped by Skookumchuck Prairie IBA • Construction areas overlapped by UWR #U-4-008 • Construction areas within or near three WHAs ▫ WHA 4-091 and 4-089 for (American badger) ▫ WHA 4-068 for American Curlew				vicinity of known or potential nesting trees • Construction areas overlapped by Skookumchuck Prairie IBA • Construction areas overlapped by UWR #U-4-008 • Construction areas within or near three WHAs: ▫ WHA 4-091 and 4-089 for (American badger) ▫ WHA 4-068 for American Curlew			

5.9.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.26**.

Table 5.26 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for SSK LTL 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
SSK LTL 219 (ILI)						
AA1	Pulp Mill - Paper Excellence Skookumchuck Pulp Mill (Skookumchuck River Road, Skookumchuck)	BTEX/VPH, EPH, PAHs PCBs, chlorinated and non-chlorinated phenols, VOCs, metals	100 m north and east	Medium	50	KO-070

Notes: APEC - Area of Potential Environmental Concern
BTEX - Benzene, Toluene, Ethylbenzene, Xylenes
PAHs - Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH - Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH - Volatile Petroleum Hydrocarbons

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.9.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.27 Regulatory Approvals and Timelines for SKK LTL 219

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Y
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	Likely	Yes
ECCC	Section 73 Permit	3 months	Likely (Lewis's woodpecker)	Likely (Lewis's woodpecker)
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Likely	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		No	Yes

5.10 FRD LTL 219 and FRD LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.1.1** and **5.1.2**. A list of permits and approvals that are expected to be required is also provided in **Section 3.0**.

5.10.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.28**.

Table 5.28 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with FRD LTL 219 and FRD LTL 168

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction areas within Nature Trust Conservation Lands • Construction areas within ALR land • Construction footprint overlaps Teck Coal Operations (Fording River, Greenhills and Elkview), areas of high industrial activity • Several construction areas located immediately adjacent to or overlap major roadways (Highways 3 and 43, and Fording Highway,) or CPR tracks	• Temporary impact to Conservation Area • Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to railway, highway, and industrial use	High	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with CPR, Teck, Nature Trust, and Ministry of Transportation and Infrastructure	• Lateral crosses Nature Trust Conservation Lands • Lateral overlaps ALR land • Lateral overlaps Teck Coal Operations (Fording River, Greenhills and Elkview), areas of high industrial activity • Several construction areas located immediately adjacent to or overlap major roadways (Highways 3 and 43, and Fording Highway,) or CPR tracks	• Temporary impact to Conservation Area • Temporary or permanent impact on soils and agricultural capacity of properties that overlap with the Project during construction • Potential challenges to construction access and timing related to railway and highway use	High	• Development and implementation of a soil management plan for work within the ALR • Site restoration activities • Engagement with CPR, Teck, Nature Trust, and Ministry of Transportation and Infrastructure
Surface Water Quality and Quantity	• 22 waterbodies cross the alignment or overlap the anticipated construction areas for FRD LTL 168 (KO_FRD LTL 168_001, 003, 004, 006, 009, 014, 025, 026, 032, 038, 041, 042, 045, 052, 062, 076, 078 to 082, 085) • 6 waterbodies cross the alignment or overlap the anticipated construction areas for FRD LL 219 (KO_FRD LTL 219_014 to 017, 023, 035)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)	• 52 waterbodies cross the alignment or overlap the anticipated construction areas for FRD LTL 168 (KO_FRD LTL 168_002 to 004, 009 to 014, 017, 018, 022, 023, 025, 026, 029 to 039, 041 to 045, 048, 051, 052, 054, 062, 063, 073 to 083, 085 to 090) • 27 waterbodies cross the alignment or overlap the anticipated construction areas for FRD LTL 219 (KO_FRD LTL 219_001, 002, 007, 008, 010, 011, 013 to 017, 020, 021, 023, 026, 207, 029, 031, 033, 035, 037 to 043)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	High	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Fish and Fish Habitat	• 19 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction areas for FRD LTL 168 (KO_FRD LTL 168_001, 004, 009, 014, 022, 025, 026, 032, 038, 041, 042, 045, 052, 060, 062, 079 to 082) • 9 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction areas for FRD LTL 219 (KO_FRD LTL 219_009, 010, 013 to 018, 023, 035)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration	• 42 waterbodies or riparian areas (considered fish habitat) cross the alignment or overlap the anticipated construction areas for FRD LTL 168 (KO_FRD LTL 168_004, 009 to 014, 017, 018, 022, 023, 025, 026, 029 to 036, 038, 039, 041, 042 to 045, 048, 051, 052, 054, 062, 063, 073 to 075, 077, 079 to 083, 090) • 27 waterbodies cross the alignment or overlap the anticipated construction areas for FRD LTL 219 (KO_FRD LTL 219_001, 002, 007, 008, 010, 011, 013 to 015, 017, 020, 021, 023, 026, 207, 029, 031, 033, 035, 037 to 043)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	High	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• Areas of mature/sensitive native vegetation near proposed construction areas • Sites of invasive vegetation near construction zones • 4 species of concern with historic mapped occurrences that overlap with construction areas (Drummonds milk-vetch, Rock Mountain willow herb, sweet-flowered fairy-candelabra, whitebark pine, and Wyoming kitten tails) • Construction areas outside of the existing RoW that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including existing individuals and suitable substrate within the subsurface root area of these individuals (within known range), as well as natural open parkland and forest openings of suitable size, substrate, and elevation for the species (within 2 km buffer zone)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement and EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities • Surveys should confirm the suspected location of Drummond's milk vetch near Michelle Creek • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons	• Areas of mature/sensitive native vegetation near proposed construction areas • 63 sites of invasive vegetation near the lateral • Four species of concern with historic mapped occurrences that overlap the lateral • Construction areas outside of the existing RoW (e.g., ROW widening) that overlap with federally-identified (proposed) critical habitat polygons for whitebark pine • Areas defined as critical habitat may be present, including existing individuals and suitable substrate within the subsurface root area of these individuals (within known range), as well as natural open parkland and forest openings of suitable size, substrate, and elevation for the species (within 2 km buffer zone)	• Temporary modification or permanent loss of mature, native vegetation as a result of ROW clearing and widening • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern (including whitebark pine) • Potential disturbance to or destruction of critical habitat	High	• Develop and implement and EMP an conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities ▫ Surveys should confirm the suspected location of Drummond's milk vetch near Michelle Creek • Conduct surveys to determine if critical habitat features of whitebark pine are present where construction areas overlap with critical habitat polygons

Environmental Receptor	Preferred Option (ILI)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• Wildlife habitat features located near proposed construction areas, including those identified during the PFR: ▫ Wildlife frees (W001, W002) • Known occurrences of species of concern that are near construction zones: ▫ American badger ▫ Gillette's checkerspot • Construction areas overlap UWR #U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation • Direct injury or mortality resulting from equipment operation	Medium	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, an conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features	• Wildlife habitat features located near lateral, including those identified during the PFR: ▫ Wildlife frees (W001, W002) ▫ Active osprey nest (W004) • Known occurrences of species of concern that are near lateral: ▫ American badger ▫ Gillette's checkerspot • Overlap of lateral with UWR #U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	High	• Develop and Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.10.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.29** and **Table 5.30**.

Table 5.29 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for FRD LTL 219

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
FRD LTL 219 (ILI)						
U6	Industrial Area Sparwood (Industrial 1 Road, Sparwood)	BTEX/VPH, EPH, PAHs, VOCs, metals	15 m east	Medium	35	KO-135
U10	Railway Crossing (north of Elk Valley Hwy and east of Elk River, Sparwood)	BTEX/VPH, EPH, PAHs, metals	On-Site	Medium	30	KO-134

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

Table 5.30 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for FRD LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
FRD LTL 168 (ILI)						
W3	Active Service Station - Elkford Mini-Mart & Fas Gas (Alpine Way, Elkford)	BTEX/VPH, EPH, PAHs, metals	On-Site	Medium	Included within W4	KO-113
W4	Active Service Station - Race Trac Gas (351 Alpine Way, Elkford)	BTEX/VPH, EPH, PAHs, metals	On-Site	High	100	KO-113

Notes: APEC – Area of Potential Environmental Concern
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes
PAHs – Polycyclic Aromatic Hydrocarbons
VOCs – Volatile Organic Compounds
PCOCs – Potential Contaminants of Concern
EPH – Extractable Petroleum Hydrocarbons
PCBs – Polychlorinated Biphenyls
VPH – Volatile Petroleum Hydrocarbons

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.10.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.31 Regulatory Approvals and Timelines for FRD LTL 218 & FRD LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (ILI)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	Likely	Likely
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	Unlikely	Unlikely
	Scientific Fish Collection Permit	2-4 weeks	Yes	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	Likely	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	Likely	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		Likely	Yes
District Municipality of Sparwood	Riparian Protection Development Permit	Up to 2 months	No	Yes
	Building permit		No	No
District Municipality of Elkford	Riparian Area Development Permit	Up to 2 months	Likely	Yes

5.11 ELK LTL 168 Risk Summary

A high-level overview of the potential environmental effects and Project risks associated with biophysical receptors and contaminated soils and groundwater are presented in **Sections 5.11.1** and **5.11.2**. A list of permits and approvals that are expected to be required is also provided in **Section 5.11.3**.

5.11.1 Biophysical Receptors

A summary of the potential effects to biophysical receptors and associated risk to the Project are provided in **Table 5.32**.

Table 5.32 Overview of Potential Effects to Biophysical Receptors and Project Risks Associated with ELK LTL 168

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Land Use	• Construction areas adjacent to the access road to active mining area	• Potential challenges to construction access and timing related to mining activity / traffic	Low	• Engagement with Teck	• Construction areas within an active mining area	• Potential challenges to construction access and timing related to mining activity	Low	• Engagement with Teck
Surface Water Quality and Quantity	• No surface waterbodies cross the lateral or overlap the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• One waterbody crosses the alignment or overlaps the anticipated construction area (KO_ELK LTL 168_001)	• Temporary loss of aquatic area • Introduction of deleterious substances into surface water (e.g., sediment, construction debris, etc.) • Temporary or permanent modification to watercourse morphology	Low	• Develop and implement an EMP and conduct environmental monitoring • Temporary site isolation • Conduct water quality baseline assessment • Construction timing (i.e., avoid periods of heavy precipitation)
Fish and Fish Habitat	• There is no fish habitat that overlaps the anticipated construction area	• No adverse effects anticipated	Nil	• N/A	• One waterbody or riparian area (considered fish habitat) crosses the alignment or overlaps the anticipated construction area (KO_ELK LTL 168_001)	• Temporary modification or permanent destruction of fish habitat • Temporary disturbance to, or displacement of fish • Direct injury or mortality to fish and macroinvertebrates • Loss of food and nutrient contribution	Low	• Develop and implement an EMP and conduct environmental monitoring • Conduct fish survey to confirm fish and fish habitat presence/absence • Where practical, design and plan Project activities to avoid fish and fish habitat • To the extent possible, undertake construction within the least-risk timing windows for applicable species • Aquatic life-form salvage • Fish habitat restoration
Vegetation	• One site of invasive vegetation near the footprint of the PRS (Station #24)	• Permanent loss of vegetation (including potential overlap with a patch of mature trembling aspen and mature conifers) in the footprint of the PRS (Station #24) • Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities	• One site of invasive vegetation along the lateral	• Spread of invasive vegetation because of increased areas of exposed soil during construction and movement of soil and seeds by equipment • Potential damage to or destruction of plant species of concern	Low	• Develop and implement an EMP and conduct environmental monitoring • Site restoration • Develop an invasive vegetation management plan to be implemented during construction • Conduct surveys for plant species of concern with a high or medium potential to be present in areas to be affected by Project activities

Environmental Receptor	Preferred Option (PRS)				Alternative Option (PLR)			
	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation	Environmental Sensitivities	Potential Effects	Project Risk	Follow-up Activities / Mitigation
Wildlife	• No specific features were identified during the PFR, but sensitive wildlife habitat features potentially present include nests, dens and burrows that may occur near construction zones •	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMPand conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct surveys for potential nests, burrows, or wildlife present prior to construction as required	• Wildlife habitat features located near the lateral, including those identified during the PFR: • Active osprey nest (W003) • Lateral overlapped by UWR # U-4-006	• Destruction of wildlife habitat features (including nests and dens) and disturbance of wildlife using these features during construction • Temporary disturbance and displacement of wildlife as a result of construction activities • Direct injury or mortality resulting from equipment operation	Low	• Develop and implement an EMP, including considerations for complying with the measures of the UWR order, and conduct environmental monitoring • To the extent practicable, undertake construction within the least-risk timing windows for applicable species • Conduct inventories and surveys (following appropriate RISC standards where applicable) for wildlife species of concern with a high or medium potential to be present and that may be affected by Project activities. Inventories and surveys should determine if nests or residences are present in areas that could be adversely affected by construction activities, to inform construction planning activities and determine if salvage will be required • Where practicable, design and plan Project activities to avoid sensitive habitats and identified wildlife habitat features

5.11.2 Contaminated Sites and Groundwater

Risk areas where additional investigation is recommended to refine the potential liabilities are presented in **Table 5.33**.

Table 5.33 Summary of Project Risk Areas - Contaminated Soil and/or Groundwater Investigation Recommended for ELK LTL 168

APEC ID	Description and Location	PCOCs	Location and Distance to Lateral	Risk Classification	Length of Risk Area (m)	Figure
ELK LTL 168 (ILI)						
No Risk Areas identified						

Notes: APEC - Area of Potential Environmental Concern PCOCs – Potential Contaminants of Concern

If additional construction work is completed outside of the previous identified areas (valves, bends, pressure regulation stations), the location should be cross-referenced with the full list of APECs in **Section 3.0** to determine if contaminated soil and/or groundwater is likely to be encountered.

5.11.3 Environmental Permitting and Approvals

Based on the results of the EOA, environmental permits and approvals will be required prior to proceeding with Project construction. A list of anticipated permits and approvals along with the estimated timeframe for issuance is provided in **Table 5.3**.

Table 5.34 Regulatory Approvals and Timelines for ELK LTL 168

Permitting Agency	Permit/Approval/ Notification Name	Time to Be Issued once Submitted	Required for Preferred Option (PRS)	Required for Alternative Option (PLR)
DFO	Request for Project Review	2-3 months	No	Unlikely
	Authorization under Paragraph 35(2)(b) (Authorization for Serious Harm)	Up to 150 days for Authorization (60 days to determine if application is complete, 90 days to issue once complete)	No	No
	Scientific Fish Collection Permit	2-4 weeks	No	Yes
ECCC	Section 73 Permit	3 months	No	No
OGC	Waste Discharge Authorization	3-6 months	No	Yes
	Short-term Water Use Approvals / Changes in and about a Stream	Issued with OGAA permit	No	Yes
MFLNROD	General Wildlife Permit	1 month	Recommended	Recommended
	Scientific Fish Collection Permit	1 month	No	Yes
Central Kootenay Regional District	Soil Removal and Deposit Permit	Up to 2 months	No	Yes
	Watercourse Development Permit		No	Yes
District Municipality of Elkford	Riparian Area Development Permit	Up to 2 months	No	Yes

6.0 GUIDING DOCUMENTS, BEST MANAGEMENT PRACTICES, AND MITIGATION MEASURES

Project activities have the potential to negatively impact environmental receptors associated with the proposed laterals. Many of these impacts can be avoided or minimized through implementation of standard best practices and mitigation measures that may be developed and implemented to minimize potential adverse effects and keep the Project in compliance with applicable legislation, regulations, and policies.

6.1 Guiding Documents and Best Management Practices

Guiding documents and Best Management Practices (BMPs) ensure that a project is planned and carried out in compliance with standard, time-tested and industry-specific methods or procedures. Guiding documents and BMPs that should be followed during Project activities, where practical, include the following:

6.1.1 Guiding Documents

- A Field Guide to Fuel Handling, Transportation and Storage (MWLAP 2002)
- A User's Guide to Working in and Around Water (MOE 2009*a*)
- BC OGC Environmental Protection and Management Guide Version 2.6 (OGC 2018)
- BC Water Quality Guidelines (MOE 2006)
- Fisheries Protection Policy Statement (DFO 2013*a*)
- FortisBC Generic Environmental Management Plan Low to Medium Risk Projects (Westland 2011)
- FortisBC Generic Environmental Management Plan for Work in and About Water (Tera 2015)
- Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing ((MOE 2009*b*)
- Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013*b*)
- Oil and Gas Waste Regulation – Users Guide (DRAFT) (MOE 2007)
- Standards and Best Practices for Instream Works: Pipeline Crossings (MOE & DFO 2015)

6.1.2 Best Management Practices

- Best Management Practices for Amphibian and Reptile Salvages in British Columbia (Wind et al. 2013)
- Best Management Practices for Bats in British Columbia (Holroyd and Craig 2016)
- Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MOE 2014)
- Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia (MFLNRO 2014)
- Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (MOE 2013)
- Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1993)
- Best Practices for Managing Invasive Plants on Oil and Gas Operations (PRRD and ISCBC 2013)

6.2 Mitigation Measures

Project-specific and site-specific mitigation measures are typically developed once the project design, timing, footprint and construction methods are known. They are developed to minimize/reduce an anticipated adverse effect.

6.2.1 Design Considerations

To the extent practicable, Project design should avoid impacts to sensitive habitats and species. Activities with locational flexibility (e.g., equipment storage, temporary workspaces) should be situated away from sensitive areas or configured to avoid interacting with the sensitive habitat or feature.

6.2.2 Project Timing

Project construction should be timed to avoid or minimize impacts to sensitive environmental receptors. There are least-risk timing windows established as guidelines to protect fish species, breeding birds and sensitive periods for other wildlife species.

6.2.2.1 Breeding Bird and Bat Least Risk Windows

Where possible, vegetation clearing and removal should be conducted outside of the breeding bird nesting period to avoid disturbance or destruction of active bird nests. The general nesting period for migratory birds may start as early as mid-March and extend until late August (ECCC 2017*b*). The following resources provide applicable breeding bird windows; however, nesting periods for each lateral should be determined by a qualified environmental professional (QEP):

- Government of Canada region-specific nesting period calendars (ECCC 2017*b*)
- Bird Studies Canada Nesting Calendar Query Tool (Bird Studies Canada 2017)

If the breeding bird window cannot be avoided, pre-construction nest surveys should be undertaken by a QEP prior to any clearing of vegetation within suitable nesting habitat.

There are 17 species of bats reported to occur regularly in BC (Nagorsen et al. 2018). Eight species are provincially red- or blue- listed (CDC 2018). Two species are listed by SARA as endangered; little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis)*, and one species (spotted bat (*Euderma maculatum*)), is listed as special concern. Additional guidance (Forestry specific BMPs for bats) are currently being developed by as Chapter 7 in the provincial BMP series (MOE 2016). Specific considerations, including timing restrictions, are being afforded to tree-type nursery roosts. In accordance with the DRAFT guidance, Hemmera recommends that a QEP be consulted if removal of trees is anticipated, as this activity may affect tree roosting habitat for bats, including little brown myotis. Site specific scheduling may be required when non-volant bat pups may be present in tree roosts.

6.2.2.2 Fisheries Least Risk Timing Windows

Fisheries work windows have been developed to minimize impacts to fish within streams and waterbodies. Any construction within fish-bearing streams should take place during these windows. The following resources can be used to determine applicable fisheries timing windows:

- Kootenay Region periods of Least Risk for Instream Works by Fish Species (MOE 2009*c*)

6.2.2.3 Amphibian and Turtle General Least Risk Periods

Amphibians and turtles are sensitive to work in and around aquatic features, particularly around ponds and wetlands. In areas where amphibians and turtles are expected, construction should be avoided during hibernation, breeding and migration periods, as determined by a QEP.

6.2.3 Fish and Wildlife Salvage

Prior to any disturbance with aquatic habitats where fish or wildlife may be encountered, aquatic lifeform (i.e., amphibian and fish) salvages are recommended. Any salvage will require necessary permits under the *Wildlife Act* (and potentially *SARA*) and the *Fisheries Act* if salmonids are expected.

6.2.4 Site Restoration

Areas disturbed during construction should be restored to meet or improve upon pre-construction conditions, particularly for work within the ALR, in and around fish habitat, and near important wildlife habitat features. Project-specific restoration plans should be developed that outline how to stabilize any disturbed areas while maximising the resultant conditions and habitat values for environmental receptors.

6.2.5 Contaminated Soil and Groundwater Management

Within the APECs identified along the existing lateral alignments, the potential for contaminated soil and groundwater to be encountered during construction poses a risk to the Project. Where construction work is planned within medium- and high-risk APECs, additional soil and groundwater investigation is recommended to determine if contamination is present, quantify expected volumes of soil and groundwater that will require management, and refine the estimated liability. The investigation will allow for the development of a soil and water management plan to be used during Project planning (e.g., tendering) and will guide the management of these materials during construction. Within low-risk APECs, the potential for encountering contamination is limited and, as such, any contaminated soil and/or groundwater encountered during construction activities should be managed on a case by case basis.

6.2.6 Environmental Management Plan and Environmental Monitoring

All construction should be undertaken in accordance with FortisBC's Generic Environmental Management Plans (Tera 2015). Additionally, project-specific Construction Environmental Management Plan(s) (CEMP) should be developed by a QEP. CEMPs should address factors such as erosion and sediment control, spill prevention and response, and provide other applicable site-specific measures to avoid or mitigate potential negative impacts to environmental resources.

Environmental construction monitoring should also be utilized to ensure the proper implementation of these mitigation measures and to confirm that any potential negative effects to the environment are avoided or minimized.

7.0 CLOSURE

The content of this report is based on information obtained during desktop studies and PFR activities. The findings presented herein should be considered within the context of the scope of work and Project terms of reference; further, the findings are time sensitive and are considered valid only at the time the report was produced. The conclusions and recommendations contained in this report are based upon the applicable guidelines, regulations, and legislation existing at the time the report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

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8.0 REFERENCES

BCUC. 2015. 2015 Certificate of Public Convenience and Necessity Application Guidelines.

Bird Studies Canada. 2017. Nesting Calendar Query Tool. <http://www.birdscanada.org/volunteer/pnw/rnest/warning.jsp>. Accessed 11 Mar 2017.

BirdLife International, Bird Studies Canada, and Nature Canada. 2018. Important Bird Areas in Canada: Site catalogue. Online Database. <http://www.ibacanada.ca/explore.jsp?lang=EN>.

BC CDC. 2017. BC Species and Ecosystems Explorer. BC Conservation Data Centre (CDC); BC Ministry of Environment, Victoria, BC. <http://a100.gov.bc.ca/pub/eswp/>. Accessed 20 Sep 2017.

Chilibeck, B., G. Chislett, and G. Norris. 1993. Land Development Guidelines for the Protection of Aquatic Habitat. Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/Library/165353.pdf>.

City of Cranbrook. 2006. City of Cranbrook Official Community Plan Bylaw No. 3550. <https://cranbrook.civicweb.net/filepro/documents/567?preview=2070>.

City of Kimberly. 2017. City of Kimberly Official Community Plan Schedule E: Environmental Protection.

Coupe, R., A. C. Stewart, and B. M. Wikeem. 1991. Chapter 15: Engelmann Spruce- Subalpine Fir Zone. Pages 125–137 *in*. Ecosystems of British Columbia. Special report series / British Columbia. Ministry of Forests; no. 6 ISSN 0843-6452, Ministry of Forests (MoF), Victoria, BC.

DataBC. 2017. New iMapBC 2.0. Government of British Columbia - DataBC. Online Database. <http://www.data.gov.bc.ca/dbc/geographic/view_and_analyze/imapbc/index.page>. Accessed 7 Mar 2017.

DataBC. 2018. DataBC. Government of British Columbia - DataBC. Online Database created by the BC Ministry of Forests, Lands and Natural Resource Operations. <https://data.gov.bc.ca/>.

DFO. 2013*a*. Fisheries Protection Policy Statement. Fisheries and Oceans Canada, Ottawa, ON. <http://www.dfo-mpo.gc.ca/pnw-ppe/pol/PolicyStatement-EnoncePolitique-eng.pdf>.

DFO. 2013*b*. Measures to Avoid Causing Harm to Fish and Fish Habitat. Fisheries and Oceans Canada (DFO). <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html>.

DFO. 2014. Science Advice for Managing Risk and Uncertainty in Operational Decisions of the Fisheries Protection Program. Science Advisory Report 2014/015, Department of Fisheries and Oceans Canada.

EC. 2014. Recovery strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada [Final]. *Species at Risk Act* (SARA) Recovery Strategy Series, Environment Canada (EC), Ottawa, ON.

ECCC. 2017*a*. Environment and Climate Change Canada. Recovery Strategy for the Whitebark Pine (Pinus albicaulis) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. viii + 54 pp.

ECCC. 2017*b*. General Nesting Periods of Migratory Birds in Canada. Environment and Climate Change Canada (ECCC) - General Nesting Periods of Migratory Birds in Canada. Government of Canada. <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4f39a78f-1>. Accessed 12 Oct 2017.

Government of Canada. 2002. Species at Risk Act. S.C. 2002, c. 29. <http://laws-lois.justice.gc.ca/eng/acts/s-15.3/>.

Government of Canada. 2018. Species at Risk Public Registry - General Questions and Answers on SARA Permits. <https://www.sararegistry.gc.ca/default.asp?lang=En&n=EA35A22E-1>. Accessed 24 May 2018.

Holroyd, S. L., and V. S. Craig. 2016. Best Management Practices for Bats in British Columbia, Chapter 4: Wind Power Developments. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10328>.

Hope, G. D., D. A. Lloyd, W. R. Mitchell, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Chapter 9: Ponderosa Pine Zone. Pages 139–151 *in*. Ecosystems of British Columbia. Special report series / British Columbia. Ministry of Forests; no. 6 ISSN 0843-6452, Ministry of Forests (MoF), Victoria, BC.

Hope, G. D., W. R. Mitchell, D. A. Lloyd, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Chapter 10: Interior Douglas-fir Zone. Pages 167–181 *in*. Ecosystems of British Columbia. Special Report Series 6, Ministry of Forests, Victoria, BC.

Hope, W. R. Mitchell, D. A. Lloyd, W. L. Harper, and B. M. Wikeem. 1991. Chapter 12: Montane Spruce Zone. Pages 125–137 *in*. Ecosystems of British Columbia. Special report series / British Columbia. Ministry of Forests; no. 6 ISSN 0843-6452, Ministry of Forests (MoF), Victoria, BC.

Ketcheson, M. V., T. F. Braumandl, D. Meidinger, G. Utzig, D. A. Demarchi, and B. M. Wikeem. 1991. Chapter 11: interior cedar - hemlock zone. Pages 167–181 *in*. Ecosystems of British Columbia. Special Report Series 6, Ministry of Forests, Victoria, BC.

MFLNRO. 2014. Guidelines for Amphibian and Reptile Conservation during Urban and Rural Development in British Columbia. BC Ministry of Forests, Lands and Natural Resource Operations, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf>. Accessed 30 Jun 2014.

MOE & DFO. 2015. Standards and Best Practices for Instream Works: Pipelin Crossings - Version 1.0. <http://www.env.gov.bc.ca/wld/instreamworks/downloads/PipelineCrossings.pdf>.

BC MOE. 2006. Riparian Areas Regulation Implementation Guidebook. <http://www.islandstrust.bc.ca/media/243086/RAR%20Local%20Government%20Implementation%20Guidebook.pdf>.

BC MOE. 2014. Develop with Care 2014: Environmental guidelines for urban and rural land development in British Columbia. B.C. Ministry of Environment, Victoria, B.C. <http://www.env.gov.bc.ca/wld/documents/bmp/devwithcare/>. Accessed 14 Oct 2014.

MOE. 1983. Land capability classification for agriculture in British Columbia. MOE Manual 1, Prepared by B.C. Ministry of Environment, Surveys and Resource Mapping Branch, and B.C. Ministry of Agriculture and Food, Soils Branch, Kelowna, B.C. <http://www.env.gov.bc.ca/wld/documents/techpub/moe1/moem1.pdf>.

MOE. 2006. British Columbia Approved Water Quality Guidelines 2006 Edition. British Columbia Ministry of Environment (MOE), Victoria, B.C. <http://www2.gov.bc.ca/gov/topic.page?id=044DD64C7E24415D83D07430964113C9>.

MOE. 2007. Oil and Gas Waste Regulation - User's Guide (Draft).

MOE. 2009*a*. A User's Guide to Working In and Around Water - Understanding the Regulation Under British Columbia's Water Act - updated. B.C. Ministry of Environment, Water Stewardship Division. <http://env.gov.bc.ca/wsd/water_rights/cabinet/working_around_water.pdf>.

MOE. 2009*b*. Technical Guidance on Contaminated Sites #1, Site Characterization and Confirmation Testing. BC Ministry of Environment. <http://www.env.gov.bc.ca/epd/remediation/guidance/index.htm>.

MOE. 2009*c*. Kootenay Region (Region 4) Periods of Least Risk for Instream Works by Fish Species. <http://www.env.gov.bc.ca/wsd/regions/okr/wateract/workwindows.html#wild>. Accessed 20 Jun 2012.

MOE. 2013. Guidelines for Raptor Conservation During Urban and Rural Land Development in British Columbia. Best Management Practices, B.C. Ministry of Environment. <http://www.env.gov.bc.ca/wld/documents/bmp/raptor_conservation_guidelines_2013.pdf>. Accessed 15 Aug 2013.

MOE. 2016. Best Management Practices for Bats in British Columbia. BC Ministry of Environment. <http://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12460>. Accessed 7 Jun 2016.

MOE. 2017. Fisheries Inventory - Fisheries Information Summary System (FISS). Provincial Database created by B.C. Ministry of Environment. <http://www.env.gov.bc.ca/fish/fiss/index.html>.

BC MOFR, and BC MELP. 2010. Field Manual for Describing Terrestrial Ecosystems - 2nd edition. British Columbia Ministry of Forests and Range & British Columbia Ministry of Environment Lands and Parks. Land Management Handbook, Forest Science Program, Victoria, BC. <https://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh25-2.htm>.

MWLAP. 2002. A Field Guide to Fuel Handling, Transportation and Storage. 3rd Edition, BC Ministry of Water, Land and Air Protection and BC Ministry of Forests. <http://www.env.gov.bc.ca/epd/industrial/oil_gas/pdf/fuel_handle_guide.pdf>.

MWLAP. 2004. Identified Wildlife Management Strategy: Procedures for Managing Identified Wildife (Version 2004). BC Ministry of Water, Land and Air Protection.

Nagorsen, D., M. Brigham,, C. Lausen, and J. Hobbs. 2018. Bats of Britsh Columbia (in Prep). Royal British Columbia Museum.

OGC. 2018. Environmental Protection and Management Guide Version 2.6. <https://www.bcogc.ca/node/5899/download>. Accessed 6 Mar 2018.

PRRD and ISCBC. 2013. Best Practices for Managing Invasive Plants on Oil & Gas Operations: A Pocket Guide for British Columbia's Oil and Gas Workers. Invasive Species Council of British Columbia and Peace River Regional District Invasive Plant Committee. <https://bcinvasives.ca/documents/OG-Guide_2013_FINAL.v2.pdf>.

Tera. 2015. FortisBC Energy Inc. / FortisBC Inc. Generic Environmental Management Plan for Works in and about Water. Prepared by Tera, a CH2M Hill Company for FortisBC, February 2015.

Wind, E. M., M. Sarell, N. Sands, and S. Sloboda. 2013. Best Management Practices for Amphibian and Reptile Salvages in British Columbia. Working Draft., Ministry of Forests, Lands, and Natural Resource Operations, Surrey, B.C.

WiTS. 2018. Wildlife Tree Stewardship Atlas. WiTS Wildlife Tree Stewardship. a BC Nature program. <http://www.wildlifetree.ca/about.html>.

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Species of Concern Potential for Occurrence Table

APPENDIX D

Waterbody Summary Table

Appendix P

ARCHAEOLOGICAL OVERVIEW ASSESSMENT REPORTS

Archaeological Overview Assessment for Natural Gas Pipeline Upgrades in Central and South-Central British Columbia—Sets 1 and 2

FortisBC Inland Gas Upgrades Project

October 15, 2018

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Executive Summary

At the request of FortisBC Energy Inc. (FortisBC), Stantec Consulting Ltd. (Stantec) conducted an archaeological overview assessment (AOA) for the transmission pressure gas pipeline laterals (laterals) that are part of Sets 1 and 2 of the proposed Inland Gas Upgrades Project. The 18 laterals considered in this AOA are in central and south-central British Columbia, between the municipalities of MacKenzie and Kelowna.

FortisBC is preparing an application for a Certificate of Public Convenience and Necessity (CPCN) under the BC Utilities Commission to authorize integrity upgrades for these laterals. The 29 laterals to be included in FortisBC's CPCN application have been divided into three sets; Sets 1 and 2 (which include 12 and six laterals, respectively) are assessed in this AOA, while Set 3 (11 laterals) is being assessed in a separate study prepared by Tipi Mountain Eco-Cultural Services Ltd. As part of the application, FortisBC will present preferred and alternate options, including in-line inspection (ILI), pipeline replacement, or pressure regulating options.

The overall objective of this AOA was to provide an assessment of archaeological risks for the laterals, and to gather sufficient information to be able to estimate the probable scope and cost of the future archaeological work that would be needed for each lateral option. FortisBC will use this information to compare the potential risks and estimate the costs for the two options in the CPCN application as part of the supporting rationale for the determinations of preferred options. Specific objectives of this AOA were to (1) identify recorded archaeological sites, if present, within the study area; (2) evaluate the potential for unrecorded sites within the study area; and, (3) provide recommendations for additional archaeological study, if/where required for future development.

The AOA consisted of a desktop study to determine the archaeological potential for all laterals, followed by a program of targeted preliminary field reconnaissance (PFR). PFRs were undertaken where in-field assessment was considered beneficial for determining the probable scope and cost of future archaeological work.

Of the 18 laterals subject to desktop assessment eight were assessed as having areas of moderate to high archaeological potential that were either further refined by PFR or recommended for archaeological impact assessment (AIA), six were assessed as having areas of moderate to high archaeological potential that were recommended for AIA (no PFR conducted), three were assessed as having areas of moderate to high archaeological potential and were further refined by PFR, and one was assessed as requiring no further work. While no archaeological sites overlap the study area, three historical sites are within the study areas of two laterals: the Salmon Arm Loop 168 overlaps historical sites EQt-32 and EdQs-24, while the Kelowna Loop 1 219 overlaps historical site DlQu-24.

The Inland Gas Upgrades Project is at a preliminary phase. As there are two options being considered for each lateral and the development plans have not yet been finalized, the recommendations are by necessity preliminary and should be reviewed for each lateral where final design includes ground disturbance. Recommendations for each lateral are summarized in the table below. Completion of AIA under an *Heritage Conservation Act* (HCA) Section 14 Heritage Inspection Permit is recommended for 17 of the 18 Set 1 and 2 laterals, the exception being BC Forest Products Lateral 168 for which no further archaeological work is recommended. While the AIAs should focus on the areas assessed as moderate and high potential, it should also include in-field verification of areas assessed as having low potential during desktop review that were not visited assessed during the PFR.

No further archaeological work is recommended for those areas assessed as having low archaeological potential that were assessed during the PFR.

One new archaeological site, EbQt-144, was recorded during the PFR near the Coldstream Loop 168 study area. The site consists of an isolated lithic surface find with a boundary currently defined as a 5 m diameter circle centered on the find. Avoidance of EbQt-144 is recommended. While the site currently falls outside the Coldstream Loop 168 study area its boundary has not been determined through shovel testing. Shovel testing under an HCA Section 14 permit within portions of the study area closest to the site is recommended to determine whether the site extends into the study area. If the site is found to extend into the study area and avoidance is not feasible, then an HCA Section 12 Alteration permit must be obtained prior to any land altering activities within site boundaries.

Summary of Results and Recommendations

Lateral Name	Lateral Length	Method of Assessment	Results	Recommendations
MACKENZIE LATERAL 168	32.5 km	Desktop review	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
MACKENZIE LOOP 168	14.3 km	Desktop review	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
BC FOREST PRODUCTS LATERAL 168	0.5 km	Desktop review	No areas of moderate or high archaeological potential identified	No further work
PRINCE GEORGE 3 LATERAL 219	5.3 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
NORTHWOOD PULP LATERAL 168/ NORTHWOOD PULP LOOP 219	7.9 km, 7.8 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with two areas of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
PRINCE GEORGE #1 LTL 168	6.3 km	Desktop review	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
PRINCE GEORGE PULP LATERAL 168	1.0 km	Desktop review	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
HUSKY OIL LATERAL 168	2.0 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
PRINCE GEORGE #2 LATERAL 219	8.7 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance

Summary of Results and Recommendations

Lateral Name	Lateral Length	Method of Assessment	Results	Recommendations
CARIBOO PULP LATERAL 168	1.3 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
WILLIAMS LAKE LOOP 1 168/WILLIAMS LAKE LOOP 2 168	3.4 km/ 2.5 km	Desktop review	Areas of moderate to high archaeological potential identified, with nine areas of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
KAMLOOPS 1 LATERAL 168/ KAMLOOPS 1 LOOP 168	3.0 km/ 3.5 km	Desktop review and PFR	Three areas of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance
SALMON ARM LOOP 168	44.9 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with two areas of high archaeological potential confirmed by PFR Study area overlaps with non-protected historical sites EQt-32 and EdQs-24	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance, potentially including deep testing/construction monitoring
SALMON ARM 3 LATERAL 168	0.8 km	Desktop review and PFR	One area of high archaeological potential confirmed by PFR	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance, potentially including deep testing/construction monitoring

Summary of Results and Recommendations

Lateral Name	Lateral Length	Method of Assessment	Results	Recommendations
COLDSTREAM LAT 219/ COLDSTREAM LOOP 168	1.8 km/ 3.7 km	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with six areas of high archaeological potential confirmed by PFR, Boundary of newly identified archaeological site EbQt-144 is 10 m north of COL LOOP 168; however, the exact site boundary has not been confirmed through shovel testing	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance, potentially including deep testing/construction monitoring, avoidance of EbQt-144
KELOWNA 1 LOOP 219	2.1 km	Desktop review	Areas of moderate to high archaeological potential identified Study area overlaps with non-protected historical site DlQu-24	AIA within areas of moderate or high archaeological potential where final design includes ground disturbance

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Abbreviations

AIA	archaeological impact assessment
AOA	archaeological overview assessment
BC	British Columbia
BP	before present
CPCN	Certificate of Public Convenience and Necessity
FortisBC	FortisBC Energy Inc.
GIS	geographic information system
HCA	*Heritage Conservation Act*
ILI	in-line inspection
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
PARL	Provincial Archaeological Report Library
PFR	preliminary field reconnaissance
RAAD	Remote Access to Archaeological Data
Stantec	Stantec Consulting Ltd.

1.0 INTRODUCTION

At the request of FortisBC Energy Inc. (FortisBC), Stantec Consulting Ltd. (Stantec) conducted an archaeological overview assessment (AOA) for the transmission pressure gas pipeline laterals (laterals) that are part of Sets 1 and 2 of the proposed Inland Gas Upgrades Project. The 18 laterals considered in this AOA are in central and south-central British Columbia, between the municipalities of MacKenzie and Kelowna (the Project; Figure 1).

1.1 PROJECT DESCRIPTION

FortisBC is preparing an application for a Certificate of Public Convenience and Necessity (CPCN) under the BC Utilities Commission to authorize pipeline integrity upgrades. The lateral pipelines deliver natural gas to or from the larger mainline transmission pipes. As part of the application, FortisBC will present preferred and alternate integrity upgrade options, including in-line inspection (ILI), pipeline replacement, or pressure regulating options. The CPCN application requires cost estimates to complete the necessary archaeological work for both the preferred and alternate options under consideration, and this AOA was completed to support that cost estimate portion of the application.

Over the past 30 years FortisBC has been retrofitting and running ILI tools in its larger and medium diameter transmission pipeline system to effectively manage the threat of corrosion. FortisBC System Integrity is considering this practice for an additional 29 of its 15.2 cm (6 in.), 20.3 cm (8 in.) and 25.4 cm (10 in.) diameter transmission pipelines and is preparing an application for a CPCN.

The 29 laterals to be included in FortisBC's CPCN application have been divided into three sets; Sets 1 and 2 (which include 12 and six laterals, respectively) are assessed in this AOA, while Set 3 (11 laterals) is being assessed in a separate study prepared by Tipi Mountain Eco-Cultural Services Ltd. The Set 1 laterals are near the communities of MacKenzie, Prince George, Quesnel, and Williams Lake, while the Set 2 laterals are near Kamloops, Salmon Arm, Vernon, Coldstream, and Kelowna.

Upgrade options for the 18 laterals considered include ILI, pressure regulation, and pipeline replacement. Pressure regulation is the least intrusive option and requires only the installation of a pressure regulation station at the start of a lateral. ILI is the next least intrusive option and will require replacement of bends to accommodate the passage of a remote sensor through the pipeline. This may be accompanied by the updating and addition of appurtenances such as the installation of control valve assemblies, ILI launchers, ILI receivers, and pressure regulating stations, as well as the replacement of bends, tees, stopple fittings, and valve assemblies. Pipeline replacement is the most intrusive option and involves the excavation, replacement, and decommissioning of a lateral (Table 1).

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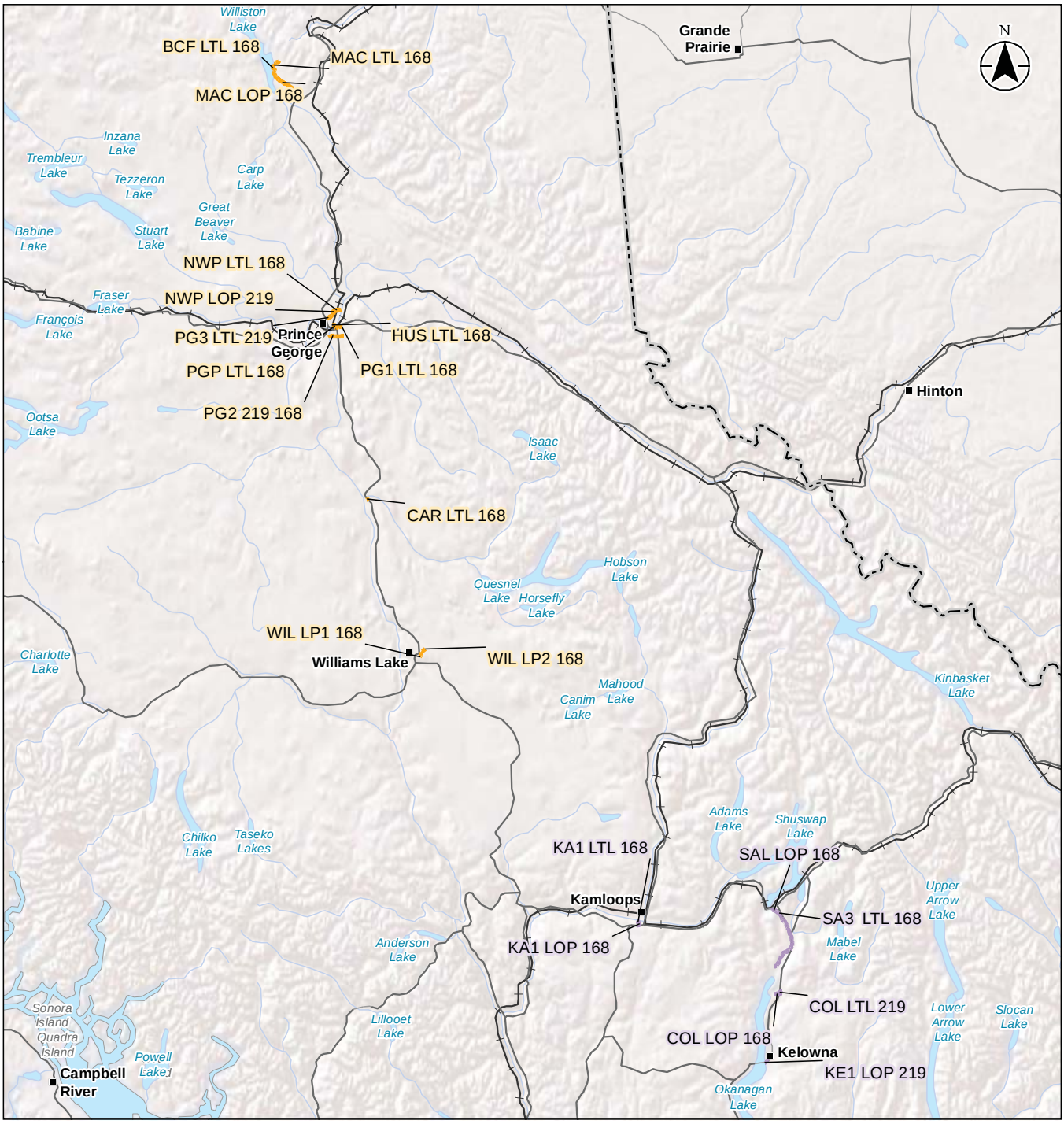

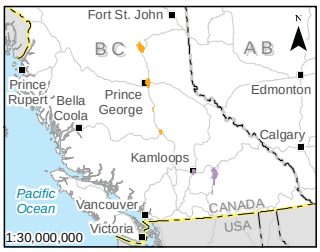

Highway
Road
Railway
Watercourse
Waterbody
Set 1 Lateral
Set 2 Lateral

0 25 50 75 100 km
1:3,500,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec FORTIS BC

Project Location
Various Locations
Interior, BC

Project Number 123221089
Prepared by TCARDINAL on 20180511
Discipline Review by RCOMMISSO on 20180515
GIS Review by TDINNEEN on 20180515

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Desktop Overview Assessment
of Archaeological Potential

Figure No.
1

Title
Location of Set 1 and Set 2 Laterals

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Table 1 Set 1 and Set 2 Laterals Summary

Lateral Name	Abbreviation	Lateral Length	Preferred Option	Alternative Option
MACKENZIE LATERAL 168	MAC LTL 168	32.5 km	ILI Program	Pipeline Replacement
MACKENZIE LOOP 168	MAC LOP 168	14.3 km	ILI Program	Pipeline Replacement
BC FOREST PRODUCTS LATERAL 168	BCF LTL 168	0.5 km	Pipeline Replacement	ILI Program
PRINCE GEORGE 3 LATERAL 219	PG3 LTL 219	5.3 km	Pressure Regulation	ILI Program
NORTHWOOD PULP LATERAL 168	NWP LTL 168	7.9 km	Pressure Regulation	ILI Program
NORTHWOOD PULP LOOP 219	NWP LOP 219	7.8 km	Pressure Regulation	ILI Program
PRINCE GEORGE #1 LTL 168	PG1 LTL 168	6.3 km	ILI Program	Pipeline Replacement
PRINCE GEORGE PULP LATERAL 168	PGP LTL 168	1.0 km	Pressure Regulation	Pipeline Replacement
HUSKY OIL LATERAL 168	HUS LTL 168	2.0 km	Pressure Regulation	Pipeline Replacement
PRINCE GEORGE #2 LATERAL 219	PG2 LTL 219	8.7 km	Pressure Regulation	ILI Program
CARIBOO PULP LATERAL 168	CAR LTL 168	1.3 km	Pipeline Replacement	Pressure Regulation
WILLIAMS LAKE LOOP 1 168/ WILLIAMS LAKE LOOP 2 168	WIL LP1 168/ WIL LP2 168	3.4 km/ 2.5 km	Pressure Regulation	ILI Program
KAMLOOPS 1 LATERAL 168	KA1 LTL 168	3.0 km	Pipeline Replacement	ILI Program
KAMLOOPS 1 LOOP 168	KA1 LOP 168	3.5 km	Pipeline Replacement	ILI Program
SALMON ARM LOOP 168	SAL LOP 168	44.9 km	ILI Program	Pipeline Replacement
SALMON ARM 3 LATERAL 168	SA3 LTL 168	0.8 km	Pipeline Replacement	ILI Program
COLDSTREAM LAT 219/ COLDSTREAM LOOP 168	COL LTL 219/ COL LOP 168	1.8 km/ 3.7 km	Pressure Regulation	ILI Program
KELOWNA 1 LOOP 219	KE1 LOP 219	2.1 km	Pressure Regulation	ILI Program

1.2 STUDY OBJECTIVES

The overall objective of this AOA was to provide an assessment of archaeological risks for the laterals, and to gather sufficient information to be able to estimate the probable scope and cost of the future archaeological work that would be needed for each lateral option. FortisBC will use this information to compare the potential risks and costs for the two options for each lateral in the CPCN application as part of the supporting rationale for the determinations of preferred options. Specific objectives of this AOA are to (1) identify recorded archaeological sites, if present, within the study area; (2) evaluate the potential for unrecorded sites within the study area; and, (3) provide recommendations for additional archaeological study, if/where required for future development.

The study area of this report encompasses the Set 1 and Set 2 project areas. As development plans have not yet been finalized for all laterals, the study area was defined as a 30 m buffer surrounding the lateral centrelines.

This area was selected to encompass the largest anticipated disturbance corridor that might be needed based on the available project design.

This AOA provides recommendations regarding the appropriate scope of further archeological work for these laterals; specifically, where archaeological impact assessments (AIAs) should be conducted. AIAs are conducted under a Provincial *Heritage Conservation Act* (HCA) Section 14 inspection permit issued by the Archaeology Branch and involve in-field inspection to assess potential project impacts to protected archeological sites. Typical AIA methods include pedestrian (foot) survey, inspection of soil exposures, excavation of subsurface tests (e.g., shovel or auger testing), and/or excavation of evaluative test units. At the end of the AIA a permit report is submitted to the Archaeology Branch.

The results of this study do not address traditional use nor does First Nations assistance constitute Aboriginal consultation. The study was conducted without prejudice to First Nations treaty negotiations, Aboriginal rights or Aboriginal title.

1.3 HERITAGE LEGISLATION

In British Columbia, heritage resources are managed in accordance with the legal requirements and conditions set forth in the HCA (Province of British Columbia 1996). The HCA extends automatic legal protection to archaeological sites if they pre-date AD 1846 or are of unknown age but may pre-date AD 1846.

The Archaeology Branch of the British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) has authority over the archaeological assessment and review processes. Under the HCA, the Archaeology Branch is responsible for deciding whether permits can be issued to allow development to take place within protected site areas and has established standards, policies, and guidelines to regulate the archaeological assessment process. This study follows current Archaeology Branch guidelines for AOAs (Archaeology Branch 2009).

2.0 STUDY AREA

The following sections provide general overviews of the environmental and ethnographic background for the study area. Detailed reviews of conditions and archaeological potential for individual laterals are included in Section 4.0.

2.1 BIOPHYSICAL SETTING

Ecological diversity and natural resource distribution played an important role in past human settlement patterns, subsistence orientations, seasonal rounds, and many other aspects of life. These important environmental characteristics changed through time with shifts in climate and through direct human intervention with the landscape (e.g., cultural burning). Although it is difficult to study rapid, short duration environmental changes, large scale, long term shifts in climate and vegetation are visible in the palaeoecological record. This section describes the physiography, climate, and ecology characteristic of the study area, including summaries of both modern conditions and the palaeoenvironment.

2.1.1 Biogeoclimatic Zones

The Project area crosses five biogeoclimatic zones including the Boreal White and Black Spruce, the Engelmann Spruce—Subalpine Fir, the Sub-Boreal Spruce, the Interior Cedar-Hemlock, and the Interior Douglas Fir zones. These biogeoclimatic zones differ widely, presenting a variety of topographic, vegetation and hydrological changes. A general description of each follows.

2.1.1.1 Boreal White and Black Spruce Zone

The Boreal White and Black Spruce Zone is a mixture of two main ecosystems: upland forests and muskeg. This zone contains several different upland forest types. The most common types are mixed stands of trembling aspen and white spruce and mixed stands of lodgepole pine and black spruce. Open lodgepole pine and lichen forests occupy drier sites. White spruce and balsam poplar flourish in well-drained river bottoms. Muskeg is most extensive on the poorly drained northeastern lowlands. The term ‘muskeg’ describes the combination of peat bogs and fens that cover extensive parts of northeast British Columbia. The most common trees in the muskeg ecosystem are stunted black spruce and tamarack with an understorey of sedges and brown mosses. Boreal grasslands and scrub communities occupy steep, south facing slopes (DeLong, Annas, and Stewart. 1991).

2.1.1.2 Engelmann Spruce – Subalpine Fir Zone

The Engelmann Spruce—Subalpine Fir Zone occupies the uppermost forested elevations in the southern three quarters of the interior of British Columbia. Steep, snow covered mountainsides are blanketed with old growth spruce and subalpine fir forests. The zone occurs mainly in steep and rugged terrain and takes in parts of all of the major mountain ranges south of the Peace River region, including the Selkirks, the Purcells, the Columbia and Rocky Mountains, and the Skeena, Babine, and Omineca ranges. Forests of Engelmann spruce and subalpine fir occupy the lower and middle elevations of this zone. Since spruce typically lives longer than fir, it usually dominates the forest canopy in mature stands. Subalpine fir is abundant in the understorey. At high elevations in the zone and in some of the wetter parts of the zone, subalpine fir can dominate. In dry areas, whitebark pine ranges north almost to McBride in the east and the Skeena River in the west. Other species—mountain hemlock, amabilis fir,

western white pine, Douglas fir, western hemlock, and Western redcedar—occur only occasionally in special circumstances. The zone contains few deciduous trees of any kind. White-flowered rhododendron is a characteristic shrub that occurs throughout the zone. Also characteristic of the subalpine are open meadows, which occur in valley bottoms, in parkland areas that receive high snowfalls, and on lower, gently sloping ground where melting snow produces continuous seepage and the ground stays moist throughout the growing season. These subalpine meadows contain a variety of flowering herbs, including Indian hellebore, arrow-leaved groundsel, subalpine daisy, paintbrush, foamflower, and Sitka valerian (Coupe, Stewart, and Wikeem 1991).

2.1.1.3 Sub-Boreal Spruce Zone

The Sub-Boreal Spruce Zone occupies large areas of BC's interior plateau. The upland forests contain a distinctive combination of tree species. The dominant coniferous species are hybrid white spruce, subalpine fir, and, occasionally, black spruce along with lodgepole pine (Meidinger, Pojar and, Harper 1991). Douglas-fir also occurs on dry, warm, rich sites. The understorey includes lilies, ferns, blueberries and devil's club. Many areas of forest are of mixed ages due to frequent fires and disturbance from logging. Trembling aspen and lodgepole pine are pioneer species in drier areas. Paper birch is another pioneer species on moist, rich sites. Forests of black cottonwood with small numbers of spruce occur on active floodplains. Spruce and subalpine fir dominate on moderately well drained sites with an understorey of black huckleberry, thimbleberry, highbush-cranberry and Sitka alder. Spruce and fir also appear as shrubs under lodgepole pine along with black huckleberry, velvet-leaved blueberry and kinnikinnick. Black gooseberry, black twinberry, bunchberry, thimbleberry, Devil's club, oak fern, and queen's cup occur in wetter areas.

2.1.1.4 Interior Cedar—Hemlock Zone

The Interior Cedar—Hemlock Zone is found east of the Coast Mountains at low-mid elevations in the Nass River Basin, parts of the Skeena Basin, and on lower slopes within the Rocky Mountains. This zone is dominated by cool wet winters and warm dry summers. The ICH Zone has the highest diversity of any other zone in British Columbia. Western hemlock and western red cedar dominate old-growth stands. Non-forested wetlands are common in the IDF Zone, and are dominated by cattail, great bulrush, and sedge ferns (Ketcheson et al. 1991).

2.1.1.5 Interior Douglas Fir Zone

The Interior Douglas Fir Zone is found east of the Coast Mountains at low-mid elevations in south-central interior British Columbia. This zone is characterized by warm, dry summers, a long growing season, and cool winters. Much of the landscape is covered by open to closed forest containing varying proportions of Interior Douglas fir. Lodgepole pine stands are present and become dominant in drier areas and those affected by crown fires as a successional species. Ponderosa Pine persists as a climax species in the driest of areas, often giving way to open grasslands whose ranges have been extensively modified in the last century by livestock grazing and fire control (Hope et al. 1991).

2.1.2 Physiography

The Project area crosses four physiogeographic regions of British Columbia including the Nechako Plateau, Central Plateau, Thompson Plateau, and Shuswap and Okanagan Highlands. Terrain within the Project area ranges from generally flat to gently rolling plateaus to rugged and steeply-sloped valleys, foothills and mountains. The study area is in the vicinity of numerous water bodies located in the Columbia and Fraser drainage basins, including the Fraser River, North Thompson River, Lake Shuswap, and Lake Okanagan.

2.1.3 Wildlife

The Project area crosses three British Columbia Ministry of Environment regions including the Omineca, Cariboo, and Thompson-Okanagan. Within these regions, a variety of fauna are present including numerous large game animals such as caribou, moose, elk, grizzly bear, black bear, mule deer, white tailed deer, and mountain goats. Smaller fur-bearing mammals such as beaver, red squirrel, rabbit, marten, marmot, wolverine, and lynx are also present in abundance. These species were and continue to be important as food, trade and clothing resources to the Aboriginal population. Fish provide an important resource as well. For instance, in the Fraser River, fish resources include a number of seasonally available anadromous species such as chinook, chum, coho, sockeye and pink salmon (Coupe, Stewart, and Wikeem 1991; DeLong, Annas, and Stewart 1991; Hope et al. 1991; Ketcheson et al. 1991; and Meidinger, Pojar and Harper 1991).

2.1.4 Palaeoenvironment

Extensive glacial ice sheets that covered the Central and Eastern Interior of British Columbia began receding by ca. 12,000 years before present (BP [where 0 BP is defined as AD 1950]) and by ca. 9,500 years BP, glaciers were no more extensive than they are today (Hodder et al. 2006; Ryder and Clague 1989). During the decay of the ice sheets, glacial lakes developed within valleys that dissect the Interior Plateau of British Columbia (Johnsen and Brennand, 2004). At this time, huge blocks of ice dammed major rivers creating glacial lakes, forcing meltwaters to change course and travel down new drainage systems. There were times throughout the Holocene where the upper Thompson and Nicola Rivers were part of a drainage system that emptied into the Columbia River system through the Okanagan Valley rather than into the Fraser River (Cannings and Cannings 1996: 38). Fulton (1969) estimated that the interior of British Columbia became ice free, with all glacial lakes drained and modern drainages established prior to ca. 8,900 years BP.

Following deglaciation, regional climate and vegetation went through several transitional stages before reaching their modern configurations. For instance, under warmer, drier conditions the Interior Douglas Fir Zone could advance northward, while during cooler, drier times the Montane Spruce Zone or Engelmann Spruce-Subalpine Fir Zone could expand down slope and occupy larger portions of the Interior.

Localized palaeoecological information for Interior British Columbia comes from Big Lake, located 9 km west of 100 Mile House (Bennett et al. 2001; Cumming et al. 2002), and Felker Lake, located 18 km south of Williams Lake (Galloway et al. 2011). From the early to mid-Holocene (up to ca. 6,840 years BP) the area around Felker Lake was likely representative of an open landscape typically associated with stands/parklands of lodgepole pine (*Pinus contorta*) or ponderosa pine (*Pinus ponderosa*). Such parklands were widespread in the British Columbia interior throughout the early post-glacial period (Mathewes and Rouse 1975, Hallett and Hills 2006, Galloway et al. 2011). Beginning ca. 6,600 years BP, conditions in the central interior began to switch from an arid climate to a more

humid one with precipitation levels eventually reaching that seen in modern times (Bennett et al. 2001). Pollen information obtained from Felker Lake suggests the area began experiencing periodically windy and/or prolonged cool springs in the period between ca. 6,840 to 2,230 years BP (Galloway et al. 2011). Felker Lake also displays evidence of a climate that is moister but still warmer than the conditions we see in the area today. Generally, in the Central Interior, sub-boreal spruce forests began to move southward, taking advantage of the more humid conditions in areas that were once too arid to support them (Hebda 2007). The Late Holocene (ca. 2,200 years BP to present) brought about modern temperatures and precipitation levels (Bennett et al. 2001). Felker Lake data corresponds suggesting an increase in snowfall levels during this period as well as a possible reduction in the frequency and severity of fires and the likelihood of a shortened fire season (Galloway et al. 2011).

Volcanic events are common in the Pacific Northwest and evidence of past eruptions are visible in the soil profiles of southern British Columbia in the form of volcanic ash (tephra). When present, archaeologists can use these deposits to assign a relative date to archaeological deposits. Since deglaciation of the area, there were at least four major volcanic eruptions that deposited layers of tephra in the Southern Interior of British Columbia. Mount Mazama, located in south-central Oregon, erupted approximately 7,700 years BP. The tephra deposits associated with this eruption are the most widely spread throughout the southern interior of British Columbia and the most prominent and distinct of ash deposits in the stratigraphy (Foit et al. 2004:1404; Yamaguchi 1983). Mount St. Helens, located in southern Washington, had three major eruptions in the past 10,000 years. The first eruption was circa 3,400 years BP, the second circa 1,480 BP and the third was on May 18, 1980 (Cannings and Cannings 1996). The first eruption left a thin, scattered tephra deposit often missed or missing from the stratigraphic profile. However, the 1,480 BP eruption represents the second most distinct tephra deposit expected to be identified in the southern interior (Foit et al. 2004:1404; Yamaguchi 1983). Circa 2,400 years BP saw the eruption of Mount Meager, located in the Coast Mountain Range of Southern British Columbia. Its ash plume travelled east and deposited tephra across the southern interior of the province, however, this deposit is not as easily identified as the Mazama and St. Helens tephra layers.

2.2 CULTURAL SETTING

The study area falls within the Subarctic/Boreal Forest and Interior Plateau archaeological ‘culture regions’, classifications defined by the Archaeology Branch.

2.2.1 Archaeology

The prehistory of the northern portion of the Interior Plateau and southern Subarctic/Boreal Forest is amongst the most poorly known in the province as few excavations have been undertaken. Studies throughout the northern half of this region indicate settlement dates spanning the last 10,700 years (Fladmark et al. 1988), showing a high density of relatively small sites primarily concentrated near major waterways, as well as sparse indications of earlier occupations (Montgomery 1979:20). Studies throughout the southern half of this region are more plentiful, although excavated sites are few in number, and indicate occupation dates spanning the last 11,500 years (Rousseau 1993; Sanger 1969).

Reported archaeological excavations producing chronometric dates in the vicinity of the study area are few in number. An excavation in 1970 at Ulkatcho Village documented a Carrier settlement representing both prehistoric and historic fur trade occupations (Donahue 1973). The Tezli site on Kluskus Creek was tested in 1971 and revealed

44 cultural depressions with occupation dates ranging between approximately 3,850 BP and 565 BP with a later surface occupation (Donahue 1970, 1972). In 1973 the Simon Fraser University archaeological fieldschool was held at Punchaw Lake. This site included 43 house platforms, 57 storage pits and part of a native trail. Dates obtained ranged to as old as approximately 3,980 BP (Fladmark 1976; Wilson and Helmer 1974). These excavations were more fully reported several years later (Montgomery 1978). Excavations in the Williams Lake to northern Lake Shuswap area have documented several house pits ranging in age from the 19th Century to 3,200 BP (Carl 1972; Kenny 1972; Williams 1974; Whitlam 1976; Wilson et al. 1998). Excavations at the Chase Burial Site near Kamloops and in the Lochnore-Nesikep locality resulted in the development of a cultural chronology of the area spanning the past 7,000 years (Sanger 1968, 1969, 1970). A mitigation project at Bear Creek Park (Arcas Consulting Archaeologists 2007) has yielded one of the few radiocarbon dates (5,130 BP) for occupation in the Okanagan Valley.

2.2.2 Ethnography and Ethnohistory

Below is a summary of land use patterns for various broad ethnic groups present in the study area, derived from ethnographic data. Emphasis has been placed on material culture, seasonal round, and subsistence strategies as they relate to activities that are most likely to have left physical evidence of past human use. First Nations whose traditional territory overlaps the Sets 1 and 2 study area have more detailed information on their traditional land use, cultural practices and history. The First Nations listed in Section 3.1 were contacted by Stantec to request information that would assist with the development of this AOA.

2.2.2.1 Carrier (Dakelh) Ethnography

The Dakelh are Athapaskan speakers and members of the Athapaskan language family. Dakelh seasonal subsistence rounds involved the summer/fall aggregation of the group at selected fishing camps chosen for the availability of migrating salmon. Salmon runs varied considerably throughout Carrier territories and required some groups to travel further than others. Nevertheless, reliance on this important food resource is characteristic of all groups in the region. Settlement near these locations involved several families who used the same fishing location each year. Berry gathering, and preservation was also carried out at this time of year. A variety of berries were available and constituted an important food source. The winter and spring saw a dispersal of the group as food stores required additions or replenishment. Game and fresh water fish were now sought, usually at nearby lakes and streams and in the surrounding forests. Caribou, elk, moose, deer, goat, and bear were among the large game animals taken. People also hunted groundhog (marmot), beaver, muskrat, lynx, and rabbit. These animals were hunted for furs and food. Late spring was the time when pine cambium was collected for an additional and sometimes necessary food source. Cambium collection creates identifiable scars on pine trees, where the bark has been stripped away in order to scrape the cambium from the tree for consumption. Evidence of tool marks on the scar, or on the bark surrounding the scar, are definite determiners of the cultural origin of the scar. This practice of cambium collection for a food source persisted well into the 1900s (Borden 1951, 1952, Cassidy & Cassidy 1980, Clark-Giesbrecht 1994, Cole and Lockner 1989, Duff 1952, Hudson 1983, Lamb 1970, Morice 1978, and Tobey 1981).

The Dakelh built a variety of above ground house types in addition to semi-subterranean dwellings (Morice 1978; Harmon 1957). These included summer and winter lodges, ceremonial lodges for feasting, fishing lodges and structures used for rites of passage. The largest of these, the ceremonial lodge, measured approximately 10 m by

15 m. The framework for the ceremonial lodge consisted of four corner posts and included a gabled roof. No excavation was required for a main foundation and evidence of postholes and central hearths are the primary features most likely to be found archaeologically for such structures. Remains of semi-subterranean pithouses are more commonly found in the archaeological record. These varied in size but averaged 7 m in width by 1 m in depth. These dwellings were constructed with log supporting beams to hold up the roof, which contained the entrance. The roof was covered with small logs, bark and earth. Small villages usually were composed of one to three or more house clusters. Daniel Harmon summarized Carrier pithouse construction in this way:

> During the winter months many of the Carriers make their dwellings in the earth, in the following manner. They dig a hole in the ground to the depth of about two feet, from the opposite sides of which, they erect two considerable sticks, to support a ridge-pole. They then lay poles from the margin of the hole to the ridge-pole, until they have completely enclosed the dwelling, excepting a hole which is left near the top, which serves the double purpose of a door by which they enter, and leave the hut, upon an upright post, in which, notches are cut; and an opening for the smoke to pass off. The poles are made tight, by stopping the interstices with hay, or by covering them with bark; and dirt is then thrown over them, to a considerable thickness (1820:307).

Food storage was accomplished through the use of cache pits. These were small circular holes dug into the ground, often along hunting trails, close to berry patches or in large numbers near village sites. The preferred location for cache pits was usually in easily excavated soils such as sands, silts, loam, and fine gravels. The pits were used for food storage and sometimes they were placed near distinctive trees or other physical features that could be easily relocated. The food was generally dried or smoked then placed into the pits layered between pieces of bark and covered with brush and earth until needed. Archaeologically, cache pits may be identified by small circular depressions varying in size and depth but averaging 1 to 2 meters in diameter and about 50 cm in depth. In historic times, the use of above ground caches was noted but this is thought to be a recent innovation (Morice 1978).

A wide variety of implements were used for hunting, fishing, and plant food gathering. Stone artifacts related to these activities such as projectile points, knives, scrapers, and flaking debris are commonly recovered in archaeological contexts. During ethnographic and historic times, many kinds of traps, snares, and hunting blinds were used. Salmon was a heavily relied upon resource so many of these items were designed to aid in the procurement of fish stores for the winter season. Large weirs built across the mouths of lakes and rivers were used to catch salmon in slow moving currents. Where water was deeper, and the currents were faster flowing, as is the case in major rivers, movable latticework traps were constructed along the shorelines. These were used in conjunction with basket traps at the top of narrow waterfalls where the migrating salmon could be caught as they attempted to jump the falls. Dip nets, leisters, and harpoons were used from rocky outcrops overlooking rapids where salmon gathered in large numbers. Many tools were made of wood, bark, and bone. Since the preservative qualities of these materials are poor, objects made of them are not commonly found in the archaeological record.

2.2.2.2 Chilcotin (Tsilqot'in) Ethnography

The Tsilqot'in are members of the Athapaskan language family. Ethnographically, Chilcotin society was organized into groups of families related through marriage and descent. The primary unit was the band, which functioned as a single unit. The Tsilqot'in camped together in villages during the winter months but the group divided in the spring, summer and fall months to hunt, fish, gather, and trade as food stores required additions or replenishment (Alexander 1996 & 1997, Lane 1981).

Salmon runs varied considerably throughout Tsilhqot'in territories and required some groups to travel further than others to access this important resource. Settlement near fishing locations involved several families who used the same fishing location each year. Kokanee and sockeye salmon, as well as trout, whitefish and suckers were caught. Fishing was usually achieved during spawning with the use of weirs placed in shallows of lakes and streams or with the use of gill nets (Alexander 1996).

Winter was usually spent near lakes where subsistence activities could concentrate on ice fishing, trapping, and some hunting. After the spring thaw, fish, root crops, and new plants provided important food sources, particularly during the spring floods that often-prevented extensive travel for hunting. Late spring was also the time when pine cambium was collected for an additional and sometimes necessary food source. As May approached, groups dispersed again to hunt, gather plants, fish, and pick berries as they became available. Hunting would often intensify in May and June. Some groups moved to the mountains in late June to hunt and collect berries. A variety of berries (see Alexander 1996 for comprehensive list) became available in the summer and constituted an important food source at this time. Caribou were hunted in the forests to the northwest and in the mountains. In the middle of July, the sockeye salmon started to spawn, and people moved to fishing camps. At the end of the salmon run groups dispersed again to hunt and gather in preparation for the winter months. Some groups moved back to the mountains and would follow the game as it migrated to the lakes in the fall. Those who had returned to the lakes for fresh water fishing would often be waiting at ambush sites along the way (Lane 1981). These ambush sites included game fences and traps set along game trails. Caribou, elk, moose, deer, goat, and bear were among the large game animals taken. People also hunted groundhog (marmot), beaver, muskrat, lynx, and rabbit. These animals were hunted for furs and food (Alexander 1996).

Historical records show that the Chilcotin wintered in pithouses like those described above. Rectangular houses with a gabled roof were more prominent during the ethnographic period, however. These dwellings had ridge poles connected to end poles that supported the rafters and horizontal roof poles. Openings in the roof allowed smoke to escape. Summer camp structures consisted of bark, bough, or mat shelters.

Food storage was accomplished through the use of cache pits, more temporary pole structures, as well as tree storage. Cache pits were small circular holes dug into the ground, often along hunting trails, close to berry patches or in large numbers near village sites (Alexander 1997). Dried fish, roots, meat, and berries were stored in these pits at winter villages. Stone artifacts related to these activities such as projectile points, knives, scrapers, and flaking debris are commonly recovered in archaeological contexts.

2.2.2.3 Nicola Ethnography

The Nicola were an Athapaskan speaking group who once occupied the Nicola and Similkameen Valleys in the southern interior of British Columbia as well as a part of Washington State (Bouchard and Kennedy 1984; Wyatt 1998). The last speaker of the Nicola language is believed to have died in 1890 and as a result, not much is known about the Nicola people and their way of life. The following review is largely taken from Wyatt (1998) which itself is mostly based on information gathered by Teit (1900–1921, 1930) Boas (1895, 1899) and Allison (1892, 1970).

The lack of salmon in the Similkeen Valley and their low numbers in the Nicola Valley suggests that Nicola subsistence strategies mostly relied on the hunting of land animals, the fishing of freshwater species and the gathering various roots and berries (Lane 1953). Teit (1900–1921) documents four separate hunts: one in the spring, one in fall as well as a winter deer drive and a winter mountain sheep drive. Men and women are believed to have taken part in the hunts and used dogs to assist them. Dogs were occasionally eaten themselves, as were coyotes and lynx. The spring to early fall period was used to gather roots and berries and travelling parties would set out west in the fall to trade for salmon and oil (Wyatt 1998).

The Nicola were known to build semi-subterranean houses as well as mat lodges which were often inhabited throughout the winter. Two winter villages were recorded by Teit (1930:214) along the shores of Nicola Lake, one is located at the lake's outflow and the other in the area that is now the community of Quilchena. Teit mentions other villages were located downstream along the Nicola River.

The population and distribution of Nicola people began to decline in 1800 after an attack by the Shushwap resulted in extermination of an entire village. The introduction of the horse lead to an increase in traffic within traditional Nicola territory by neighboring bands including the Shushwap, Thompson, and Okanagan, and later by Europeans. By 1835, the Nicola were relegated to the Nicola Valley. These factors lead to an increase in competition for resources, an escalation in warfare and the eventual loss of the Nicola culture (Wyatt 1998).

Very little is known about Nicola material culture and traditional ways of life. Teit (1930) mentions birch baskets being commonly produced by the Nicola as well as their purchasing of cedar root baskets from the Thompson. Teit also describes the use of a snowshoe with a distinctive Nicola-type sole (Teit 1900: fig. 241) and the use of a "notched flaked stone" for straightening arrow shafts (Teit 1930: 218). The archaeology of the area does not provide much more detail. Microblades normally associated with Athapaskan people have been recorded in the Nicola and Similkameen Valleys (Arcas Associates 1986) but lithic assemblages collected from the area have not been sufficiently analyzed to allow for the identification of firm links to Athapaskan culture (Wyatt 1998).

The Nicola believed in good and evil spirits (Allison 1892). Upon their deaths, individuals were buried in new clothes, tools and weapons and a feast was held in their honour where a portion of the food was burnt as an offer. Carved figures were occasionally used as grave markers. Wyatt (1998) notes that if it the evil spirits which lead to the death of an individual continued to haunt band members, the deceased's body was then exhumed, wrapped in new clothes and reburied.

2.2.2.4 Okanagan Ethnography

The Okanagan are speakers of the Okanagan or nsilxcín language, and a part of the Interior Salish ethno-linguistic group. The Okanagan occupy the region which stretches from the Mica Creek area north of Revelstoke, British Columbia, down to the community of Wilbur in the state of Washington. From east to west they occupy the areas between Kootenay Lake and the Nicola Valley. The Okanagan Nation Alliance represents eight-member groups: the Okanagan Indian Band, the Upper Nicola Band, the Westbank First Nation, the Penticton Indian Band, the Osoyoos Indian Band, the Lower and Upper Similkameen Indian Bands, and the Colville Confederated Tribes. Much of the ethnographic information presented here derives from the work of Kennedy and Bouchard (1998).

As semi-nomadic hunter-gatherers, the Okanagan were equally dependent on hunting, fishing, and gathering to meet their subsistence needs (Kennedy and Bouchard 1998). Four important hunting seasons reported in ethnographies describe the hunting of deer and sheep in the spring, deer, elk, sheep and bear in the fall, deer in midwinter and sheep in late winter (Teit 1930). Deer hunts were communally organized and involved complex logistical, tactical, and spiritual preparations by participants. Double-curved bows, flat bows, and snares were used to catch wildlife. Traps were sometimes set up as deer were driven over pitfalls or patches of thin ice. Hunting dogs were occasionally employed to chase the deer towards the hunters (Kennedy and Bouchard 1998). Smaller animals were also hunted for food, such as beaver, groundhogs (marmots), hares, martens, and porcupine, while predators such as wolf, coyote, fox, lynx, otter, ermine, fisher, and weasel were sought for their furs (Kennedy and Bouchard 1998: 241). Salmon fishing was an important part of the Okanagan subsistence strategy and fish were caught with basketry traps, weirs, leisters, hooks and line, seine nets, dip nets, and harpoons (Kennedy and Bouchard, 1998) Other types of fish procured by the Okanagan include various trout species, grayling, and white sturgeon (Hudson 1990).

Gathered foods included Saskatoon berries, bitterroot, arrowroot, tree lichen, mushrooms, green shoots, tree cambium and various nuts, seeds, and berries. Many of these items were dried and stored in cache pits for winter consumption. Subsistence strategies were greatly affected by the Okanagan belief system which placed restrictions on who was allowed to hunt/fish/gather, who could prepare certain foods and who could eat what and when. Special ceremonies were conducted around many important subsistence activities such as communal hunt ceremonies, first-fruits and first-roots ceremonies, and first salmon ceremonies among others (Kennedy and Bouchard 1998; Kennedy 1971–1991; Turner, Bouchard and Kennedy 1980; Teit 1930; Hill-Tout 1911).

Winter congregations of semi-subterranean pit houses and/or mat lodge dwellings occurred in the sheltered creek valleys common to the area whereas canvas or mat covered tepees were used in the summer when groups would disperse. Pit house floors were two to six feet below the ground surface and housed one to two families (Hudson 1990) whereas the lodges were occasionally excavated up to two feet below the ground surface, had separate entrances for men and women and were constructed in oblong or conical shapes. The oblong structures ranged between 6 and 18 metres in length. Separate structures were built for birthing children, menstruating women, and unmarried girls. Men and women used separate sweat lodges (Kennedy and Bouchard 1998). Villages or groups of villages consisted of bands headed by a chief. Households were connected through kinship, association or simply as a result of geographic proximity (Kennedy and Bouchard 1998). Households were patrilocal and occasionally polygamous (Kennedy and Bouchard 1998).

2.2.2.5 Secwépemc Ethnography

The Secwépemc, also known as the Shuswap, is today a collective of 17 Aboriginal communities whose traditional territories occupy south central British Columbia, from the Columbia River valley along the Rocky Mountains in the east, to the Fraser River in the west, and the Arrow lakes and Castlegar in the south. This expansive territory covers roughly 180,000 km^2 of the Province (Ignace 1998: 203). Although the bands were separate and independent in traditional times, they were united by a common language, belief system and culture practices. Secwépemctsìn is the language of the Secwépemc and 1 of 22 languages in the Salish language family. Before the smallpox epidemic in 1862 there were 32 Secwépemc bands speaking 4 dialects (Boas 1891, 1899; Dawson 1891). Today the remaining 17 bands are divided into 2 tribal councils. The Shuswap Nation Tribal council comprises 10 bands: Kenpesq't (Shuswap); Sk'etsin (Neskonlith); Cstélen (Adams Lake); Simpcw (North Thompson); Skeetchestn; Splats'in (Spallumcheen); St'uxwtews (Bonaparte); Tk'emlùpsemc (Kamloops); Pelltq't (Whispering Pines/Clinton);

Quaaout (Little Shuswap). The Northern Shuswap Tribal Council represents seven bands: Xats'ull/Cm'etem' (Soda Creek, Deep Creek); Stswecem'c/Xgat'tem (Canoe Creek, Dog Creek); T'exelc (Williams Lake); Tsq'escen' (Canim Lake). Non-affiliated bands are the Tsk'weylecw (Pavillion); Esketemc (Alkali Lake); and Llenlleney'ten (High Bar) (Ignace 2008).

The traditional Secwépemc seasonal round measured the years in the number of snows, or swucwt. Beginning in the late fall season which marked the preparation for winter in the main villages, the men of the village hunted for game on snowshoes and trapped various fur bearing animals. When the lakes had frozen over, ice fishing was practiced. During the approximate month of December was the Secwépemc winter solstice when the village celebrated spiritual practices and lived on stored provisions (December–February) and on what game could be trapped, hunted or what could be fished through the ice. The cold month of January was called Pell7émtmin or "stay-at-home month". Once spring had arrived, the people harvested root plants, going to increasingly higher elevations as the snow melted between March and late May. Large cutthroat and rainbow trout runs were also fished in lakes in the middle and high plateaus. Late spring, known as Pellsqepts or "Chinook wind month" signaled the beginning of salmon fishing season (March to October), starting with Spring salmon, followed by Sockeye until early fall. Coho were fished in late fall. Large portions of the fish caught were dried and stored in cache pits for winter use. The Secwépemc used a variety of fishing strategies, including an extensive use of fish traps, weirs, fences, and nets to capture large quantities of salmon in the Fraser and Thompson Rivers and their many tributaries. Between early and late summer, more than twenty species of berries were picked in great quantities, and like root plants, they were harvested at higher and higher elevations on the plateaus during the season as the snow disappeared. This wide variety and great abundance of berries was boiled and made into cakes or eaten fresh. While at these higher elevations, marmots were also hunted in the mountains. From late summer to early fall, larger ungulates were hunted, and their meat was dried for winter use (Ignace 2008: 141; Teit 1909: 515).

Salmon fishing was an extremely successful industry for the Secwépemc, who employed dip nets, fish spears, hook and line, and intricate weirs and traps to catch the vast quantities of salmon that passed through the rivers. Teit believed that the rapids of the Chilcotin River at the mouth of the Canon was the most important fishery in SecwépemcúĺecW (Teit 1930: 525). Local histories described the importance of the salmon fishery. "After the big salmon runs in late summer, the trails were travelled by pack horses straining under the heavy loads of baled, dried salmon headed southward, some of it for Indians over on the American side, whose forebears had traded for it long before there was a boundary line, or a white man in the country. Then came the settlers who ran amok when they saw the salmon run, killing them for pleasure after they had their barrels full, and slaughtering them for fertilizer. Then came lumbermans' sluice dams" (Mitchell 1925: 6-7).

Trade between the Secwépemc and their neighbours was an important economic activity. Once the Hudson Bay Company was established in their territory after 1812, the Secwépemc traded large bundles of furs, berries, dried meat, salmon, and horses in exchange for muskets, steel traps, and glass beads (Teit 1909: 537). What was known as the "gatekeeper communities" on the boundaries of SecwépemcúĺecW acted as middlemen between other Secwépemc communities and the neighbouring Nations including the Tsilhqot'in, the Sekewemc (Cree), Ktunaxa in the Kootenays, and the Okanagan Nation to the south. They often traded salmon, salmon oil, and root crops with their neighbours for dentalium shells, woven goat hair blankets, rabbit skin robes, and buffalo hides. Feathers were also a much sought-after trade item, such as geese and swan feathers, the tail feathers of red-shafted flickers and hawks, the feathers of adult golden eagles, and the scalps of pileated woodpeckers. Food plants such as bitterroot and hazelnuts, and medicinal plants such as Canby's lovage, which was an important medicine for Interior Salish

groups in British Columbia and Washington State, were also traded. Cáclep (present day Fountain) on the Fraser River was an important trading center where many different Nations would travel to trade for salmon. Another important trade center at the center of SecwépemcúÍecw was located at Green Lake. Trading began when the trout were running in late spring, and many families convened here for several weeks each year for trade, play games or meet future spouses (Ignace and Favrholdt 2017: 220-227). Waterways and trail networks connected Secwépemc communities between each other and their neighbours. They were used as an integral component of the trade networks that existed long before initial contacts with Europeans. With the arrival of fur traders, settlers and gold miners in the nineteenth and twentieth centuries, these trails became wagon roads and, “eventually built up as highways and railways, finally becoming the main arteries of traffic we know today” (Ignace and Farvholdt 2017: 229).

3.0 METHODS

3.1 FIRST NATIONS CORRESPONDENCE

The following First Nations whose asserted traditional territories overlap with the study area were contacted to request information that would assist with the assessment of archaeological potential. In coordination with FortisBC's Community and Aboriginal Engagement Team, based on proximity of the community to the study area some First Nations were invited to participate in the preliminary field reconnaissance (PFR) field program.

- Adams Lake Indian Band
- Ashcroft Indian Band
- Blueberry River First Nations
- Bonaparte Indian Band
- Bonaparte Indian Band
- Boothroyd Band
- Canim Lake Band
- Carrier Chilcotin Tribal Council
- Coldwater Indian Band
- Cook's Ferry Indian Band
- Doig River First Nation
- Esh-kn-am Cultural Resources Management Services
- Halfway River First Nation
- Lheidli T'enneh First Nation
- Lhoosk'uz Dene Nation
- Lhtako Dene First Nation
- Little Shuswap Lake Indian Band
- Lower Nicola Indian Band
- Lower Similkameen Indian Band
- Lytton First Nation
- McLeod Lake Indian Band
- Nak'azdli Whut'en'
- Nazko First Nation
- Neskonlith Indian Band
- Nicola Tribal Association
- Nlaka'pamux Nation Tribal Council
- Nooaitch Indian Band
- Northern Secwepemc Tribal Council
- Okanagan Indian Band
- Okanagan Nation Alliance
- Oregon Jack Creek Indian Band
- Penticton Indian Band
- Siska Indian Band
- Skeetchestn Indian Band
- Skuppah Indian Band
- Splats'in First Nation
- Spuzzum First Nation
- Stk'emlupsemc te Secwepemc Nation
- Tk'emlups te Secwepemc
- Tsilhqot'in National Government
- Ulkatcho First Nation
- Upper Nicola Indian Band
- West Moberly First Nation
- Whispering Pines/ Clinton Band
- Williams Lake Indian Band
- Xats'ull First Nation
- Oregon Jack Creek Indian Band
- Penticton Indian Band
- Siska Indian Band
- Skeetchestn Indian Band
- Skuppah Indian Band
- Splats'in First Nation
- Spuzzum First Nation
- Stk'emlupsemc te Secwepemc Nation
- Tk'emlups te Secwepemc
- Tsilhqot'in National Government
- Ulkatcho First Nation
- Upper Nicola Indian Band
- West Moberly First Nation
- Whispering Pines/ Clinton Band

3.2 DESKTOP ARCHAEOLOGICAL POTENTIAL ASSESSMENT

The AOA consisted of a desktop assessment of potential for all laterals, followed by a program of targeted PFR. PFRs were undertaken only when in-field assessment would be beneficial for determining the probable scope and cost of future archaeological work.

The desktop assessment reviewed relevant archaeological, historical, ethnographic, and environmental studies. It assessed areas of moderate to high archaeological potential, low archaeological potential, and areas where the archaeological potential should be confirmed PFR. The following information sources were consulted:

- Tree Age Class data from MFLNRORD Vegetation Resources Inventory
- Surficial geology data from the Ministry of Energy, Mines and Petroleum Resources surficial geology map database
- Recorded historical site information, archaeological site information, and AOA predictive models available from the Archaeology Branch's Remote Access to Archaeological Data (RAAD) database
- Previous archaeological assessment reports within and near the study area available on the Archaeology Branch's Provincial Archaeological Report Library (PARL) application
- Mapping and digital imagery of the study area, including aerial photographs and contour mapping

The desktop assessment uses designations of moderate and high archaeological for consistency with existing AOA predictive models. Moderate to high archaeological potential was assigned to portions of the study areas which appear in surficial imagery to be without previous development-related disturbance exceeding the anticipated maximum depth of cultural deposits, are not submerged, and meet two or more of the following criteria:

- Within 500 m of a recorded archaeological site or historical site
- Within 500 m of a major river
- Within 300 m of a named watercourse or water body, or unnamed watercourse or water body along which archaeological sites have been recorded
- Within relatively level, well-drained terrain
- Within landforms of high archaeological potential such as paleo shorelines, fluvial or lacustrine terraces, valley rims, flat-topped glacial features such as kames and eskers, and benches
- Within an area assessed by an AOA predictive model as having moderate or high archaeological potential
- Within areas identified in previous archaeological reports as being archaeologically sensitive

Laterals for which pipeline replacement was not an identified option will only be subject to upgrades-related disturbance within limited areas. As development plans for these upgrades have not yet been finalized, their locations were estimated by applying a 50 m buffer to either side of pipeline bends along the longitudinal pipeline axis, and a 100 m buffer along the longitudinal axis to each pipeline terminus. The 60 m width of each lateral study area was maintained.

3.3 PRELIMINARY FIELD RECONNAISSANCE

As the main objective of the AOA was to gather sufficient information for determine the probable scope and cost of future archaeological work, PFRs were only undertaken where the fieldwork was likely to provide information about the level of effort or methods that may be required. Field work was confined to public lands and private lands for which FortisBC had secured access permission. PFR field work was conducted with the participation of local First Nations when available, with field teams generally consisting of two First Nations representatives and one Stantec archaeologist. Transect intervals ranged from 5 to 30 m, based on visibility and presence of soil exposures.

4.0 RESULTS

4.1 BACKGROUND INFORMATION REVIEW

The 18 laterals comprising Sets 1 and 2 were subject to desktop assessment based on landscape, environment, and proximity to previous recorded archaeological and heritage resources. This assessment assessed areas of moderate to high archaeological potential, which in some cases were refined by PFR. As a result of the desktop assessment:

- Eight laterals were assessed as having areas of moderate to high archaeological potential, some of which were further refined by PFR and some of which were recommended for AIA survey.
- Six laterals were assessed as having areas of moderate to high archaeological potential that were recommended for AIA survey
- Three laterals were assessed as having areas of moderate to high archaeological potential were further refined by PFR, and
- One lateral was assessed as requiring no further work

While no recorded archaeological sites overlap the study area, three recorded historical sites that are not protected by the HCA are within the study area: Salmon Arm Loop 168 overlaps historical sites EQt-32 and EdQs-24, while the Kelowna Loop 1 219 overlaps with historical site DlQu-24.

A total of 31 recorded heritage sites are within 1 km of the proposed project area and are described in Table 2 below.

Table 2 Recorded Heritage Sites within 1 km of the Project area

Borden Number	Site Type	Nearest Lateral	HCA Permit Number(s)
FgRo-1	Precontact and historical, cultural features	CAR LTL 168	1973-28
FfRo-20	Precontact, cultural features, burials	CAR LTL 168	1991-112, 1995-230
FfRo-22	Precontact, cultural features	CAR LTL 168	1991-112
EbQt-138	Precontact, subsurface lithic scatter	COL LTL 219/COL LOP 168	2015-243
EbQt-3	Precontact, subsurface lithic scatter	COL LTL 219/COL LOP 168	2009-207
EbQt-137	Precontact, subsurface lithic scatter	COL LTL 219/COL LOP 168	2015-243
EbQt-2	Precontact, surface lithic scatter	COL LTL 219/COL LOP 168	2009-207
FlRq-4	Precontact, cultural features	HUS LTL 168	1981-28
DlQu-21	Precontact, subsurface lithic scatter	KE1 LOP 219	1978-8, 2007-54
DlQu-20	Precontact, subsurface lithic scatter	KE1 LOP 219	1978-8
DlQu-202	Precontact, subsurface lithic scatter	KE1 LOP 219	2007-54
DlQu-22	Precontact, subsurface lithic scatter	KE1 LOP 219	1978-8, 2007-54
DlQu-19	Precontact, surface lithic scatter	KE1 LOP 219	1978-8
DlQu-220	Precontact, surface lithic find	KE1 LOP 219	2015-129
FlRq-1	Precontact, cultural feature	PG1 LTL 168	1973-28
FlRq-28	Precontact, surface lithic find	PG1 LTL 168/PGP LTL 168/ HUS LTL 168	2017-0112
FlRq-27	Precontact, surface lithic scatter	PG1 LTL 168/PGP LTL 168/ HUS LTL 168	2017-0112
FlRq-24	Precontact, subsurface lithic scatter	PG2 219 168	2016-106
EdQs-32	Precontact, surface lithic scatter, pictogram	SAL LOP 168	1984-40
EcQt-8	Precontact, surface lithic scatter	SAL LOP 168	1967-6
EdQs-2	Precontact, cultural features	SAL LOP 168	1973-28, 1984-31
EdQs-23	Historical burials	SAL LOP 168	1984-31
EcQt-4	Precontact, cultural feature, surface lithic scatter	SAL LOP 168	n/a
EcQt-5	Precontact, surface lithic scatter	SAL LOP 168	1967-6
EcQt-12	Precontact burial	SAL LOP 168	2006-251
EdQs-12	Precontact, surface lithic scatter	SAL LOP 168	1979-5, 1984-31
EcQt-3	Precontact, cultural feature, shell midden	SAL LOP 168	1967-6
EcQt-6	Precontact, surface lithic scatter	SAL LOP 168	1967-6
EcQt-2	Precontact, cultural features, subsurface lithic scatter	SAL LOP 168	1967-6
EdQs-18	Precontact, cultural features, surface lithic scatter	SAL LOP 168	1984-31

The Northern Secwepec Archaeological Potential Model, Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution, and Quesnel Forest District Geographic Information System (GIS) Model of Archaeological Potential indicates numerous areas of moderate and high archaeological potential within the proposed project area (Archaeology Branch 2018; Heffner 2009). Where additional desktop and PFR data was available the results of these models were reassessed, which may have resulted in either an expansion or reduction of the modelled areas of high potential.

4.2 ARCHAEOLOGICAL POTENTIAL ASSESSMENT

Archaeological potential was assessed for the entire lateral study area even where the options being considered do not include whole line replacement. The recommendations for each lateral need to be considered in light of the proposed upgrade options. Where AIA is recommended, this is specific to project activities that would involve ground disturbance within areas identified as having moderate or high archaeological potential. For the ILI and pressure regulation options, AIA would only be required for small portions of the lateral. An AIA is not required for areas identified as having moderate or high archaeological potential if no ground disturbing activity is being proposed.

4.2.1 Set 1

Set 1 consists of 12 laterals near the communities of MacKenzie, Prince George, Quesnel, and Williams Lake (Table 3). The AOA results for each lateral are described below.

Table 3 Set 1 Laterals—Archaeological Overview Assessment Methods and Results

Lateral	Assessment Method	Assessment Results
MAC LTL 168	Desktop review	Areas of moderate to high archaeological potential identified
MAC LOP 168	Desktop review	Areas of moderate to high archaeological potential identified
BCF LTL 168	Desktop review	No areas of moderate or high archaeological potential identified
PG3 LTL 219	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR
NWP LTL 168/ NWP LOP 219	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with two areas of high archaeological potential confirmed by PFR
PG1 LTL 168	Desktop review	Areas of moderate to high archaeological potential identified
PGP LTL 168	Desktop review	Areas of moderate to high archaeological potential identified
HUS LTL 168	Desktop review	Areas of moderate to high archaeological potential identified
PG2 LTL 219	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR
CAR LTL 168	Desktop review and PFR	Areas of moderate to high archaeological potential identified
WIL LP1 168/ WIL LP2 168	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with nine areas of high archaeological potential confirmed by PFR

4.2.1.1 Mackenzie Lateral 168 (MAC LTL 168)

Mackenzie Lateral 168, located south of the community of Mackenzie, British Columbia, measures 32.5 km in length (Appendix A, Figures A.1-1 to A.1-18). The lateral was assessed by desktop review, which identified 13 areas with moderate to high potential within the study area. This assessment of potential was based on the anticipated presence of well-drained landforms associated with watercourses, wetlands, and water bodies within the Gataiga Creek, Chichouyenily Creek, Lion's Lake, and Williston Lake drainages.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.1.2 Mackenzie Loop 168 (MAC LOP 168)

Mackenzie Loop 168, located south of the community of Mackenzie, British Columbia, measures 14.3 km in length (Appendix A, Figures A.2-1 to A.2-9). The lateral was assessed by desktop review, which identified seven areas with moderate to high potential within the study area. This assessment of potential was based on the anticipated presence of well-drained landforms associated with Mischinsinika Creek, Buth Creek, and unnamed tributaries of the Parsnip River.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.1.3 BC Forest Products Lateral 168 (BCF LTL 168)

BC Forest Products Lateral 168, located in the community of Mackenzie, British Columbia, measures 0.5 km in length (Appendix A, Figure A.3-1). The lateral was assessed by desktop review which assessed the study area as low archaeological potential due to previous disturbance related to the existing BC Forest Products mill, distance to local hydrological features, distance to recorded sites, and low-lying, featureless terrain.

4.2.1.4 Prince George 3 Lateral 219 (PG3 LTL 219)

Prince George 3 Lateral 219, located in the community of Prince George, British Columbia, measures 5.3 km in length (Appendix A, Figures A.4-1 to A.4-2). The lateral was assessed by desktop review and PFR. Three areas with moderate to high potential were identified within Prince George 3 Lateral 219 study area during the desktop review. This assessment of potential was based on the anticipated presence of well-drained landforms associated with McMillan Creek and an unnamed tributary of Williston Lake.

PFR was conducted within two of the areas assessed as having moderate to high potential during the desktop review. The PFR was conducted on June 18, 2018 by Brigitte Aubertin (Stantec) and Mike Gouchie (Lheidli T'enneh Nation) and resulted in the identification of four areas of high archaeological potential.

Area of high archaeological potential AOP1-PG3-2a consists of a 35 m (north/south) by 10 m portion within the project area of relatively level bench (Photo 1). This well-drained landform overlooks McMillan Creek and an associated wetland 80 m to the south and extends outside of the project area to the north and south. Vegetation consists of an aspen and subalpine spruce canopy with Saskatoon berry, lupine, bunchberry, yarrow, Prickly Rose, and grass understory and ground cover. A recently collapsed cabin and associated outhouse lie within this area of high potential (Photo 2).

Photo 1 View South of AOP1-PG3-2a

Photo 2 View Northwest of Collapsed Cabin within AOP1-PG3-2a

Area of high archaeological potential AOP1-PG3-4 consists of a 25 m (northeast/southwest) by 10 m portion within the project area of gently sloping ridge top forming a small point (Photo 3). This well-drained landform overlooks McMillan Creek 100 m to the south and extends outside of the project area to the north. Vegetation consists of intermittent lodgepole pine and aspen with yarrow, sweet pea, alder, Prickly Rose, black twinberry, strawberry, juvenile pine, juvenile birch, and grass understory and ground cover.

Photo 3 View Southwest of AOP1-PG3-4

Area of high archaeological potential AOP1-PG3-9 consists of a 120 m (north/south) by 15 m portion within the project area of gently sloping terrace edge (Photo 4). This well-drained landform overlooks McMillan Creek and associated wetland 20 m to the east and extends outside of the project area to the north and south. There are numerous sand exposures within the area resulting from previous sand extraction activities immediately to the west, which were visually inspected. No cultural material was observed. There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of aeolian deposits. Vegetation consists of intermittent lodgepole pine, subalpine fir, and aspen with yarrow, Prickly Rose, strawberry, juvenile pine, fireweed, and grass understory and ground cover.

Photo 4 View Northeast of AOP1-PG3-9

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.1.5 Northwood Pulp Lateral 168 (NWP LTL 168)

Northwood Pulp Lateral 168, located in the community of Prince George, British Columbia, measures 5.3 km in length (Appendix A, Figures A.5-1 to A.5-4). The lateral was assessed by desktop review and PFR. Three areas of moderate to high potential were identified within Northwood Pulp Lateral 168 study area during desktop review. This assessment of potential was based on the anticipated presence of floodplains or well-drained landforms associated with the Fraser River and two of its unnamed tributaries.

PFR was conducted at four locations within the identified areas of moderate to high potential during the desktop review. The PFR was conducted on June 19, 2018 by Brigitte Aubertin (Stantec) and Mike Gouchie (Lheidli T'enneh Nation) and resulted in the identification of two areas of high archaeological potential.

Area of high archaeological potential AOP1-NWP-LTL-1 consists of a 65 m (east/west) by 30 m portion within the project area of relatively level terrace edge (Photo 5). This well-drained landform overlooks the Fraser River 150 m to the south, is immediately north of an associated wetland, and extends outside of the study area to the east and west. Vegetation consists of a cottonwood canopy with a red osier dogwood, fireweed, and grass understory and ground cover (Photo 5).

Photo 5 View South of AOP1-NWP-LTL-1

Area of high archaeological potential AOP1-NWP-LTL-3 consists of a 95 m (northwest/southeast) by 15 m portion within the project area of relatively level terrace edge (Photo 6). This well-drained landform overlooks the Fraser River floodplain to the southwest, is immediately northeast of an unnamed seasonal tributary of the Fraser River, and extends outside of the study area to the northwest and southeast. There is a cottonwood and white spruce canopy on the downslope with salal, grass, and moss understory and ground cover. The terrace itself is currently in use as a cattle pasture and vegetation consists of grass, yarrow, plantains, dandelions, and sedges.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

Photo 6 View Southeast of AOP1-NWP-LTL-3

4.2.1.6 Northwood Pulp Loop 168 (NWP LOP 168)

The Northwood Pulp Loop 168 study area is entirely overlapped by the larger Northwood Pulp Lateral 168 study area (Appendix A, Figures A.6-1 to A.6-3). Results of the assessment of this area are described above.

4.2.1.7 Prince George #1 Lateral 168 (PG1 LTL 168)

Prince George #1 Lateral 168, located in the community of Prince George, British Columbia, measures 6.3 km in length (Appendix A, Figures A.7-1 to A.7-3). The lateral was assessed by desktop review, which identified three areas with moderate to high potential within the study area. This assessment of potential was based on the anticipated presence of well-drained landforms associated with Bittner Creek and the Fraser River.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and poorly drained or featureless terrain.

4.2.1.8 Prince George Pulp Lateral 168 (PGP LTL 168)

Prince George Pulp Lateral 168, located in the community of Prince George, British Columbia, measures 1.0 km in length (Appendix A, Figure A.8-1). The lateral was assessed by desktop review, which identified two areas with moderate to high potential within the study area. This assessment of potential was based on their location on the banks of the Fraser River.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance or location within the current channel of the Fraser River.

4.2.1.9 Husky Oil Lateral 168 (HUS LTL 168)

Husky Oil Lateral 168, located in the community of Prince George, British Columbia, measures 2.0 km in length (Appendix A, Figure A.9-1). The lateral was assessed by desktop review, which identified one area with moderate to high potential within the study area. This assessment of potential was based on its location on the Fraser River floodplain within 500 m of the current channel.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance.

4.2.1.10 Prince George #2 Lateral 219 (PG2 LTL 219)

Prince George #2 Lateral 219, located in the community of Prince George, British Columbia, measures 8.7 km in length (Appendix A, Figure A.10-1 to A.10-5). The lateral was assessed by desktop review and PFR. Six areas with moderate to high potential were identified within Prince George #2 Lateral 219 study area during desktop review. This assessment of potential was based on the anticipated presence of well-drained landforms associated with recorded archaeological site FlRq-24, Zogas Creek, Ellacott Creek, and an unnamed tributary of the Fraser River.

The PFR was conducted at three locations within the identified areas of moderate to high potential during the desktop review. The PFR was conducted from June 20 to 21, 2018 by Brigitte Aubertin (Stantec) and Mike Gouchie (Lheidli T'enneh Nation) and resulted in the identification of three areas of high archaeological potential.

Area of high archaeological potential AOP1-PG2a consists of a 60 m (north/south) by 10 m portion within the project area of relatively level to gently sloping terrace edge (Photo 7). This well-drained landform overlooks Zogas Creek 15 m to the east and extends outside of the study area to the north and south. Vegetation consists of a subalpine fir, aspen, lodgepole pine, and Interior Douglas fir canopy with a Prickly Rose, black twinberry, trailing raspberry, trailing twinflower, sweet pea, false Solomon's seal, and grass understory and ground cover.

Photo 7 View South of AOP1-PG2a

Area of high archaeological potential AOP1-PG2b consists of a 60 m (north/south) by 10 m portion within the project area of relatively level to gently sloping terrace edge (Photo 8). This well-drained landform overlooks Zogas Creek 15 m to the west and extends outside of the study area to the north and south. The west edge of the area of high potential is bounded by previous disturbance related to Boundary Road. Vegetation consists of a subalpine fir, aspen, lodgepole pine, and Interior Douglas fir canopy with a Prickly Rose, black twinberry, alder, false Solomon's seal, and grass understory and ground cover.

Photo 8 View South of AOP1-PG2b

Area of high archaeological potential AOP1-PG2-3 consists of an 80 m (north-northwest/south-southeast) by 20 m portion within the project area of relatively level to gently sloping terrace edge (Photo 9). This well-drained landform overlooks an unnamed tributary of the Fraser River 100 m to the west and extends outside of the study area to the north and south. Vegetation consists of a subalpine fir, white spruce, paper birch, and aspen canopy with a Prickly Rose, gooseberry, huckleberry, soapberry, black twinberry, cranberry, bunchberry, and moss understory and ground cover.

Photo 9 View North of AOP1-PG2-3

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.1.11 Cariboo Pulp Lateral 168 (CAR LTL 168)

Cariboo Pulp Lateral 168, located in Quesnel, British Columbia, measures 1.3 km in length (Appendix A, Figure A.11-1). The lateral was assessed by desktop review and PFR. One area with moderate to high potential was identified within Cariboo Pulp Lateral 168 study area during desktop review. This assessment of potential was based on the anticipated presence of well-drained landforms and floodplain associated with the Fraser River, and overlap with areas of high archaeological potential identified by the Quesnel Forest District GIS Model of Archaeological Potential.

PFR was conducted at two locations within the identified area of moderate to high potential during the desktop review. PFR was conducted on June 27, 2018 by Erin Davison (Stantec) and Tim Michell (Lhtako Dené Nation). Based on the PFR the assessment of potential was revised to low. All areas subject to PFR were found to be low-lying and poorly drained (Photo 10). Vegetation consists of intermittent aspen and black spruce with a broad-blade grass, cleavers, mustard, cattail, bulrushes, sedges, and moss. The portions of the study area that were not visited during the PFR are also rated as low archaeological potential due to previous development-related disturbance, distance to recorded sites, and low-lying and poorly drained terrain.

Photo 10 View Northwest of East Portion of CAR LTL 168

4.2.1.12 Williams Lake Loop #1 and #2 168 (WIL LP1/WIL LP2 168)

Williams Lake Loop #1 and #2 168, located in the community of Williams Lake, British Columbia, measure 3.4 km and 2.5 km in length, respectively (Appendix A, FiguresA.12-1 to A.12-3). The laterals were assessed by desktop review and PFR. Two areas with moderate to high potential were identified within the Williams Lake Loop #1 and #2 168 study areas during desktop review. This assessment of potential was based on the anticipated presence of well-drained landforms associated with Missioner Creek and the Minton Lake drainage, as well as overlap with areas of high and moderate archaeological potential identified by the Northern Secwepec Archaeological Potential Model.

The PFR was conducted at two locations within the identified areas of moderate to high potential during the desktop review. The PFR was conducted on June 22 and June 29, 2018, by Brigitte Aubertin (Stantec), Trista Johnson (Williams Lake Indian Band), Leo Michel (Williams Lake Indian Band), and Glen Dixon (Xatśūll First Nation), and resulted in the identification of nine areas of high archaeological potential.

Area of high archaeological potential AOP1-WILa consists of a 45 m (west-northwest/east-southeast) by 10 m portion within the project area of gently sloping ridge top (Photo 11). This well-drained landform overlooks an unnamed tributary of Minton Lake 5 m to the southwest and extends outside of the study area to the east. Vegetation consists of a white spruce, subalpine fir, and Interior Douglas fir canopy with a Prickly Rose, black twinberry, twisted stalk, arnica, and grass understory and ground cover.

Photo 11 View West of AOP1-WILa

Area of high archaeological potential AOP1-WILb consists of a 45 m (west-northwest/east-southeast) by 10 m portion within the project area of gently sloping terrace edge (Photo 12). This well-drained landform overlooks an unnamed tributary of Minton Lake 5 m to the northeast and extends outside of the study area to the southeast. The area is a manicured lawn and has been partially disturbed by previous landscaping activities.

Photo 12 View East of AOP1-WILb

Area of high archaeological potential AOP2-WIL consists of a 25 m (east/west) by 15 m portion within the project area of gently sloping bench (Photo 13). This well-drained landform overlooks an unnamed pond associated with Minton Lake 30 m to the northwest. Vegetation consists of an Interior Douglas fir and aspen canopy with sparse Saskatoon berry, Oregon grape, Prickly Rose, strawberry, yarrow, and grass understory and ground cover.

Photo 13 View Northwest of AOP2-WIL

Area of high archaeological potential AOP3-WIL consists of a 15 m (northeast/southwest) by 8 m portion within the project area of gently sloping bench (Photo 14). This well-drained landform overlooks an unnamed pond associated with Minton Lake 30 m to the northwest and extends outside of the study area to the west. Vegetation consists of an Interior Douglas fir and aspen canopy with sparse Oregon grape, yarrow, and grass understory and ground cover.

Photo 14 View North of AOP3-WIL

Area of high archaeological potential AOP1-WIL03 consists of a 65 m (northwest/southeast) by 20 m portion within the project area of relatively level to gently sloping bench (Photo 15). This well-drained landform overlooks an unnamed pond associated with Minton Lake 10 m to the southwest and extends outside of the study area to the northwest. Vegetation consists of an Interior Douglas fir and aspen canopy with sparse Prickly Rose, false spirea, arnica, soap berry, Saskatoon berry, kinnikinnick, Oregon grape, strawberry, and grass understory and ground cover.

Photo 15 View Southwest of AOP1-WIL03

Area of high archaeological potential AOP2-WIL03 consists of a 35 m (northwest/southeast) by 10 m portion within the project area of relatively level to gently sloping top of an elongated knoll (Photo 16). This well-drained landform overlooks an unnamed pond associated with Minton Lake 5 m to the north and extends outside of the study area to the southeast. Vegetation consists of an Interior Douglas fir and aspen canopy with a Prickly Rose, false spirea, arnica, soap berry, Saskatoon berry, kinnikinnick, Oregon grape, strawberry, and grass understory and ground cover.

Photo 16 View Northwest of AOP2-WIL03

Area of high archaeological potential AOP1-WIL4a consists of a 60 m (northwest/southeast) by 10 m portion within the project area of relatively level to gently sloping terrace edge (Photo 17). This well-drained landform overlooks an unnamed tributary of Missioner Creek 5 m to the southwest and extends outside of the study area to the east. Vegetation consists of an Interior Douglas fir and aspen canopy with a Prickly Rose, false spirea, arnica, Saskatoon berry, Oregon grape, strawberry, and grass understory and ground cover.

Photo 17 View Southeast of AOP1-WIL4a

Area of high archaeological potential AOP1-WIL4b consists of a 25 m (northwest/southeast) by 10 m portion within the project area of relatively level to gently sloping terrace edge (Photo 18). This well-drained landform overlooks an unnamed tributary of Missioner Creek 5 m to the northeast and extends outside of the study area to the southwest. Vegetation consists of an Interior Douglas fir and aspen canopy with a Prickly Rose, arnica, Saskatoon berry, Oregon grape, and grass understory and ground cover.

Photo 18 View Northwest of AOP1-WIL4b

Area of high archaeological potential AOP1-WIL06 consists of a 12 m (east/west) by 8 m gently sloping bench (Photo 19). This well-drained landform overlooks an unnamed tributary of Missioner Creek 10 m to the north. Vegetation consists of an Interior Douglas fir, paper birch, and lodgepole pine canopy with a Prickly Rose, highbush cranberry, false spirea, trailing twinflower, arnica, moss, and grass understory and ground cover.

Photo 19 View East of AOP1-WIL06

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.2 Set 2

Set 2 consists of six laterals near the communities of Kamloops, Salmon Arm, Vernon, Coldstream and Kelowna (Table 4). AOA results for each lateral are described below.

Table 4 Set 2 Laterals—Archaeological Overview Assessment Methods and Results

Lateral	Assessment Method	Assessment Results
KA1 LTL 168/ KA1 LOP 168	Desktop review and PFR	Three areas of high archaeological potential confirmed by PFR
SAL LOP 168	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with two areas of high archaeological potential confirmed by PFR Study area overlaps with non-protected historical sites EQt-32 and EdQs-24
SA3 LTL 168	Desktop review and PFR	One area of high archaeological potential confirmed by PFR
COL LTL 219	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR
COL LOP 168	Desktop review and PFR	Areas of moderate to high archaeological potential identified, with three areas of high archaeological potential confirmed by PFR, Boundary of newly identified archaeological site EbQt-144 is 10 m north of COL LOP 168; however, the exact site boundary has not been confirmed through shovel testing
KE1 LOP 219	Desktop review	Areas of moderate to high archaeological potential identified, overlaps with historical site DlQu-24

4.2.2.1 Kamloops 1 Lateral and Loop 168 (KA1 LTL 168/KA1 LOP 168)

Kamloops 1 Lateral and Loop 168, located in the community of Kamloops, British Columbia, measure 3.0 km and 3.5 km in length, respectively (Appendix B, Figures B.1-1 to B.1-2). The laterals were assessed by desktop review and PFR. One area with moderate to high potential was identified within Kamloops 1 Lateral and Loop 168 study area during desktop review comprising the entire northern half of these laterals; an approximately 2.2 km segment. This area was considered to have moderate to high archaeological potential during desktop review due to the anticipated presence of floodplains or well-drained landforms associated with the Fraser River and two of its unnamed tributaries.

The entire area assessed as moderate to high potential during the desktop review was subject to PFR. The PFR was conducted on June 18, 2018 by Adam Hossack (Stantec) and resulted in the identification of three areas of high archaeological potential.

Area of high archaeological potential AOP1-KA1 consists of a 75 m (north/south) by 10 m portion within the project area of relatively level terrace edge bordering a deeply incised, unnamed ephemeral drainage (Photo 20). Approximately 7 metres of sorted silt sand fluvial deposits with sub-rounded and rounded pebble inclusions are visible in numerous soil exposures in the drainage channel wall. These exposures were inspected, and no cultural material was observed. There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of fluvial deposits.

This well-drained landform overlooks the North Thompson River 1 km to the northeast and is bounded by previous disturbance related to the existing pipeline on is west edge. Vegetation consists of intermittent lodgepole pine with a sagebrush, Prickly Rose, yarrow, Prickly Pear cactus, and grass understory and ground cover.

Photo 20 View Southeast of AOP1-KA1

Area of high archaeological potential AOP2-KA1 consists of a 20 m (east/west) by 15 m relatively level knoll top at the brow of the North Thompson Valley (Photo 21). This well-drained landform has views of the North Thompson River to the north and northeast, and Lake Kamloops to the northeast. Vegetation consists of sagebrush and grass. There are numerous exposures of fluvial silt sand with sub-rounded to rounded pebble inclusions within the area, which were visually inspected. No cultural material was observed.

Photo 21 View Northeast of AOP2-KA1

Area of high archaeological potential AOP3-KA1 consists of a 15 m (east/west) by 10 m relatively level knoll top at the brow of the North Thompson Valley (Photo 22). This well-drained landform has views of the North Thompson River to the north and northeast. Vegetation consists of sagebrush and grass. There are numerous exposures of fluvial silt sand with sub-rounded to rounded pebble inclusions within the area, which were visually inspected. No cultural material was observed.

Photo 22 View North of AOP3-KA1

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.2.2 Salmon Arm Loop 168 (SAL LOP 168)

Salmon Arm Loop 168, located south of the community of Salmon Arm, British Columbia, measures 44.9 km in length (Appendix B, Figures B.2-1 to B.2-23). The lateral was assessed by desktop review and PFR. Five areas of moderate with high potential were identified within Salmon Arm Loop 168 study area during desktop review. This assessment of potential was based on the following factors: the anticipated presence of well-drained landforms associated with John Brook, Sherban Brook, Canoe Creek, Crossman Creek, Deep Creek, Fortune Creek, Gardom Creek, Sutton Creek, Bergerac Lake, Otter Lake, Waby Lake, and the Shuswap River; overlap with areas of high and moderate archaeological potential identified by the Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution; proximity to recorded historical sites EdQs-24 and EeQt-32; and proximity to recorded archaeological sites EcQt-3, EcQt-8, EcQt-12, EdQs-2, EdQs-12, EdQs-18, and EdQs-33.

The PFR was conducted at two locations within the identified areas of moderate to high potential during the desktop review. The PFR was conducted on June 19, 2018 by Adam Hossack (Stantec) and Phyllis Jezewsky (Splatsin First Nation) and resulted in the identification of two areas of high archaeological potential.

Area of high archaeological potential AOP1-SAL1 consists of a 50 m (north/south) by 45 m portion within the project area of relatively level to gently sloping sand dune top (Photo 23). This well-drained landform overlooks the former channel of a rechannelized unnamed tributary of Canoe Creek 10 m to the southeast, has views of Canoe Creek 180 m to the east, and extends outside of the study area to the west. Vegetation consists of a lodgepole pine canopy with an Oregon grape, lichen, kinnikinnick and grass understory and ground cover outside of the existing pipeline Right of Way, and of grass, kinnikinnick, juvenile pine, dandelion, and plantain within it. The existing pipeline bisects this area, and previous landscaping activities related to the existing golf course have removed the landform to the east. There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of aeolian deposits visible in this cut.

Photo 23 View Southeast of AOP1-SAL1

Area of high archaeological potential AOP2-SAL1 consists of a 65 m (west-northwest/east-southeast) by 40 m portion within the project area of relatively level to gently sloping area on the south terminus of a large sand dune complex (Photo 24). This well-drained landform overlooks the former channel of a rechannelized unnamed tributary of Canoe Creek 25 m to the southeast, has views of Canoe Creek 190 m to the east, and extends outside of the study area to the west. The existing pipeline bisects this area, and its western portion is partially disturbed by a parking lot, service roads, and landscaping related to the exiting Canoe Creek Golf Club (Photo 25). There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of comparable aeolian deposits visible in AOP2-SAL1, which lies within the same dune complex. Vegetation consists of a lodgepole pine canopy with an Oregon grape, lichen, kinnikinnick, Prickly Rose, and grass understory and ground cover outside of the areas of previous disturbance, and of sparse mustard, Oregon grape, plantain, and grass within it.

Photo 24 View Northeast of AOP2-SAL1

Photo 25 View West of AOP2-SAL1

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and undulating, steeply sloped, or featureless terrain.

4.2.2.3 Salmon Arm 3 Lateral 168 (SA3 LTL 168)

Salmon Arm 3 Lateral 168, located south of the community of Salmon Arm, British Columbia, measures 0.8 km in length (Appendix B, Figure B.3-1). The lateral was assessed by desktop review and PFR. The entire Salmon Arm Lateral 3 168 study area was determined to be of moderate to high archaeological potential during desktop review. This assessment of potential was based on the anticipated presence of well-drained landforms associated with Canoe Creek and two of its unnamed tributaries and overlap with areas determined to be of moderate archaeological potential by the Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution.

The entire Salmon Arm Lateral 3 168 was subject to PFR. PFR was conducted on June 19, 2018 by Adam Hossack (Stantec) and Phyllis Jezewsky (Splatsin First Nation) and resulted in the identification of one area of high archaeological potential.

Area of high archaeological potential AOP1-SA31 consists of a 60 m (east/west) by 30 m portion within the project area of relatively level to gently sloping area on the north terminus of a large sand dune complex (Photo 26). This well-drained landform overlooks the former channel of a rechannelized unnamed tributary of Canoe Creek 50 m to the north and extends outside of the study area to the east and west. The existing pipeline bisects this area, and its southern portion is partially disturbed by landscaping related to the exiting Canoe Creek Golf Club (Photo 27). There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of comparable aeolian deposits visible in AOP2-SAL1, which lies within the same dune complex. Vegetation consists of a lodgepole pine canopy with an Oregon grape, lichen, trailing raspberry, yarrow, kinnikinnick, Prickly Rose, and grass understory and ground cover outside of the areas of previous disturbance, and of grass and plantain within it.

Photo 26 View west of AOP1-SA31

Photo 27 View Northwest of Previous Disturbance Southeast of AOP2-SA31

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.2.4 Coldstream Lateral 219 (COL LTL 219)

Coldstream Lateral 219, located in the community of Coldstream, British Columbia, measures 1.8 km in length (Appendix B, Figure B.4-1). The lateral was assessed by desktop review and PFR. Two areas with moderate to high potential were identified within Coldstream Lateral 219 study area during desktop review. These areas were considered to have moderate to high archaeological potential during desktop review due to the anticipated presence of floodplains or well-drained landforms associated with Vernon Creek, and overlap with areas of high archaeological potential identified by the Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution.

The entirety of the identified areas of moderate to high potential were subject to PFR. The PFR was conducted from June 22 to 23, 2018 by Adam Hossack (Stantec), Keona Joe (Okanagan Indian Band), and Levi Trant (Okanagan Indian Band), and resulted in the identification of three areas of high archaeological potential.

Area of high archaeological potential AOP1-COLLTL2 consists of a 70 m (north/south) by 25 m portion within the project area of a point of land on a high bench on the west Vernon Creek Valley brow immediately south of an unnamed ephemeral drainage, with views of Vernon Creek to the east and Lake Okanagan to the northeast (Photo 28 and Photo 29). Approximately 20 metres of sorted silt sand fluvial deposits with sub-rounded and rounded pebble inclusions are visible in numerous soil exposures in the valley wall immediately to the east. These exposures were inspected, and no cultural material was observed. There is the potential for deeply buried cultural deposits to be present in this area due to the observed depth of fluvial deposits. The area is relatively level and well drained. Recorded lithic sites EbQt-137 and EbQt-138 are located on a similar landform on the east Vernon Creek Valley brow approximately 800 m to the southeast.

The area of high archaeological potential extends outside of the study area to the southwest and southeast. Vegetation consists of and open meadow of grass, arrowroot, alfalfa, yarrow, cinquefoil, burdock, sagebrush, clover, and occasional hawthorns.

Photo 28 View Southeast of AOP1-COLLTL3

Photo 29 View Southeast from AOP1-COLLTL2 of EbQt-138

Area of high archaeological potential AOP1-COLLTL3 consists of a 50 m (north/south) by 20 m portion within the project area of floodplain immediately east of Vernon Creek (Photo 30 and Photo 31). This area is approximately 50 m south of the Polson Trail, an important First Nations travel corridor through the Vernon Creek Valley in the post-contact and precontact periods (Keona Joe: personal communication). The area of high archaeological potential extends outside of the study area to the north and south. The area has been extensively disturbed by previous development activities related to the existing pipeline and the Vernon Golf and Country Club, but there is the potential for deeply buried cultural deposits to be present below the level of disturbance due to the presence of deep fluvial sediments in the Vernon Creek floodplain. Vegetation consists of grass, sedge, willow, plantain, dandelion, and Oregon grape.

Photo 30 View Southeast of AOP1-COLLTL3

Photo 31 View South of Vernon Creek near AOP2-COLLTL3

Area of high archaeological potential AOP2-COLLTL3 consists of a 30 m by 30 m portion within the project area of floodplain immediately west of Vernon Creek (Photo 32). This area is approximately 70 m south of the Polson Trail, an important First Nations travel corridor through the Vernon Creek Valley in the post-contact and precontact periods (Keona Joe: personal communication). The area of high archaeological potential extends outside of the study area to the north and south. The area has been extensively disturbed by previous development activities related to the existing pipeline and the Vernon Golf and Country Club, but there is the potential for deeply buried cultural deposits to be present below the level of disturbance due to the presence of deep fluvial sediments in the Vernon Creek floodplain. Vegetation consists of grass, sedge, willow, plantain, dandelion, and Oregon grape.

Photo 32 View Northeast of AOP2-COLLTL3

Area of high archaeological potential AOP2-KA1 consists of a 20 m (east/west) by 15 m relatively level knoll top at the brow of the North Thompson Valley (Photo 21). This well-drained landform has views of the North Thompson River to the north and northeast, and Lake Kamloops to the northeast. Vegetation consists of sagebrush and grass. There are numerous exposures of fluvial silt sand with sub-rounded to rounded pebble inclusions within the area, which were visually inspected. No cultural material was observed.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance, distance to local hydrological features, distance to recorded sites, and steeply sloped or featureless terrain.

4.2.2.5 Coldstream Loop 168 (COL LOP 168)

Coldstream Loop 168, located in the community of Coldstream, British Columbia, measures 3.7 km in length (Appendix B, Figures B.5-1 to B.5-3). The lateral was assessed by desktop review and PFR. Four areas with moderate to high potential were identified within Coldstream Loop 168 study area during desktop review. These areas were considered to have moderate to high archaeological potential during desktop review due to the anticipated presence of floodplains or well-drained landforms associated with Vernon Creek and its unnamed tributaries, proximity to recorded archaeological site EbQt-3, and overlap with areas of moderate and high archaeological potential identified by the Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution.

The PFR was conducted at seven locations within the identified areas of moderate to high potential. PFR was conducted from June 22 to 23, 2018 by Adam Hossack (Stantec), Keona Joe (Okanagan Indian Band), and Levi Trant (Okanagan Indian Band), and resulted in the identification of three areas of high archaeological potential.

Area of high archaeological potential AOP1-COLLOP1 consists of a 30 m by 30 m portion within the project area of relatively level to gently sloping low ridge top 20 m southwest of an unnamed ephemeral drainage (Photo 33). The area is well drained, located on a large bench with views northwest of Lake Okanagan, and is within 1 km of traditional First Nations travel corridor Mission Road (Keona Joe: personal communication). The area of high archaeological potential extends outside of the study area to the west. Vegetation consists of manicured lawn.

Photo 33 View Southeast of AOP1-COLLOP1

Area of high archaeological potential AOP2-COLLOP1 consists of a 70 m (east/west) by 45 m portion within the project area of relatively level to gently sloping Vernon Creek Valley brow crossed (northwest/southeast) by two unnamed ephemeral drainages (Photo 34). The area is well drained, located on a large bench, has views northwest of Lake Okanagan and north of Vernon Creek, and is approximately 1 km from traditional First Nations travel corridor Mission Road (Keona Joe: personal communication). The area of high archaeological potential extends outside of the study area to the northeast, north, and west. The area is currently a pasture, with vegetation consisting of arrowroot, mustard, Scotch thistle, alfalfa, clover, and grass with the occasional hawthorn. The area has frequent soil exposures created by livestock wallows and rodent burrows, which were inspected. No cultural material was observed within AOP2-COLLOP1. Exposed soils consist of a shallow humus layer overlying silt sand with sub-rounded to rounded pebble inclusions.

Photo 34 View West-northwest of AOP2-COLLOP1

Surface inspection of a soil exposure approximately 10 m north of the Coldstream Loop 168 study area resulted in the identification of new archaeological site EbQt-144 (Photo 35 and Photo 36). This site consists of one jasper biface thinning flake (SF 1) measuring 24 mm long by 16 mm wide by 5 mm thick, which is potlidded on its ventral and dorsal surfaces. SF 1 was observed on the surface in a soil exposure created by a rodent burrow and was left *in situ*. It is situated on the brow of a large bench overlooking the confluence of Vernon Creek and Lake Okanagan. The site boundary is currently defined as a 5 m diameter circle centered on the find; however, this bench landform (including AOP2-COLLOP1) has high archaeological potential) and future inspection (e.g. shovel testing) may result in the expansion of the site boundaries. Management recommendations for EbQt-144 are discussed in Section 5.0.

Photo 35 Archaeological Site EbQt-144, view north

Photo 36 Archaeological Site EbQt-144, SF 1

Area of high archaeological potential AOP3-COLLOP1 consists of a 12 m by 12 m area of relatively level to gently sloping low ridge top 30 m west of an unnamed ephemeral drainage (Photo 37). The area is well drained, located on a large bench with views northwest of Lake Okanagan, is 150 m south of archaeological site EbQt-144, and is approximately 1 km from a traditional First Nations travel corridor, Mission Road (Keona Joe: personal communication). The area is currently a cattle pasture, with vegetation consisting of arrowroot, Scotch thistle, alfalfa, clover, and grass.

Photo 37 View Northwest of AOP3-COLLOP1

4.2.2.6 Kelowna 1 Loop 219 (KE1 LOP 219)

Kelowna 1 Loop 219, located in the community of Kelowna, British Columbia, measures 2.1 km in length (Appendix B, Figures B.6-1 to B.6-2). The lateral was assessed by desktop review. Two areas with moderate to high potential was identified within Kelowna 1 Loop 219 study area during desktop review. This assessment of potential was based on the anticipated presence of floodplains or well-drained landforms associated with Mill Creek, proximity to recorded archaeological sites DlQu-19, DlQu-20, and Dl-Qu21, overlap with historical site DlQu-24, and overlap with areas of moderate and high archaeological potential identified by the Okanagan Timber Supply Area AOA Model of Archaeological Resource Distribution.

The remainder of the proposed project area is assessed as having low archaeological potential due to previous development-related disturbance.

5.0 RECOMMENDATIONS

The Inland Gas Upgrades Project is at a preliminary phase. As there are two options being considered for each lateral and the development plans have not yet been finalized, the recommendations are by necessity preliminary and should be reviewed for each lateral where final design includes ground disturbance.

Recommendations for each lateral are summarized in Table 5. Completion of AIA under an HCA Section 14 Heritage Inspection Permit is recommended for 17 of the 18 Set 1 and 2 laterals, the exception being BC Forest Products Lateral 168 for which no further archaeological work is recommended. While the AIAs should focus on the areas assessed as moderate and high potential, it should also include in-field verification of areas assessed as having low potential during desktop review that were not visited assessed during the PFR. No further archaeological work is recommended for those areas assessed as having low archaeological potential that were assessed during the PFR.

One new archaeological site, EbQt-144, was recorded during the PFR near the Coldstream Loop 168 study area. The site consists of an isolated surface lithic with a boundary defined as a 5 m diameter circle centered on the find. The site boundary is approximately 8 m north of the Coldstream Loop 168 study area and is outside of the anticipated extent of ground disturbance from the project; however, the portion of the study area closest to the site was assessed to have high archaeological potential (AOP2-COLLOP1). While the site boundary as currently recorded falls outside the Coldstream Loop 168 study area, AIA involving shovel testing under an HCA Section 14 permit is recommended prior to any ground disturbance at AOP2-COLLOP1 to confirm the potential extent of EbQt-144 in this area. Avoidance of EbQt-144 is recommended. If avoidance is not feasible, an HCA Section 12 Alteration permit must be obtained prior to any land-altering activities within site boundaries.

Table 5 Summary of Recommendations

Project Component	Areas with Archaeological Potential	Recommendations for Areas of Proposed Ground Disturbance
MAC LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
MAC LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
BCF LTL 168	Entire study area assessed as having low archaeological potential	No further work
PG3 LTL 219	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-PG3-2a identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-PG3-4 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
	AOP1-PG3-9 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
NWP LTL 168/ NWP LOP 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-NWP-LTL-3 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-NWP-LTL-1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
PG1 LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
PGP LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
HUS LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed

Project Component	Areas with Archaeological Potential	Recommendations for Areas of Proposed Ground Disturbance
PG2 LTL 219	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-PG2a identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-PG2b identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-PG2-3 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
CAR LTL 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
WIL LP1 and LP2 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-WILa identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-WILb identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP2-WIL identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP3-WIL identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-WIL03 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP2-WIL03 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-WIL4a identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-WIL4b identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP1-WIL06 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing

Project Component	Areas with Archaeological Potential	Recommendations for Areas of Proposed Ground Disturbance
KA1 LTL and LOP 168	AOP1-KA1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
	AOP2-KA1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP3-KA1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
SAL LOP 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-SAL1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
	AOP2-SAL1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
SA3 LTL 168	AOP1-SA31 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
COL LTL 219	AOP1-COLLTL2 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
	AOP1-COLLTL3 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
	AOP2-COLLTL3 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing and deep testing/ construction monitoring
COL LOP 168	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed
	AOP1-COLLOP1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP2-COLLOP1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
	AOP3-COLLOP1 identified during PFR	AIA of areas of proposed ground disturbance, including shovel testing
KE1 LOP 219	Areas of moderate to high archaeological potential identified in desktop review	AIA of areas of proposed ground disturbance, including survey and testing if needed

6.0 CLOSURE

When considering the AOA results, it is important to note that an assessment of low archaeological potential does not mean there is *no* potential for archaeological sites. It is possible for archaeological sites to be located outside of areas assessed as having high archaeological potential.

The present study was designed solely to identify the potential for evidence of past human activity protected under the HCA (1996). It is not the intent of this report to evaluate traditional aboriginal use, nor is the intent to address potential impacts to post-1846 cultural heritage resources within the study area. Archaeological sites which pre-date AD 1846 are automatically protected from inadvertent or intentional destruction by the HCA (1996). To address the discovery of any unanticipated archaeological finds, it is recommended that the proponent inform their personnel and contractors that, if possible archaeological materials are encountered, all development activities near these archaeological materials must be suspended immediately. The Archaeology Branch as well as potentially affected First Nations must be notified as soon as possible of the existence of the archaeological finds and the nature of the disturbance.

Respectfully submitted,

Stantec Consulting Ltd.

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7.0 REFERENCES

Alexander, D. 1996. A Literature Review of Native Land Use in the Northern Half of the Horsefly Forest District. First Draft, Vancouver, B.C. On file at the Ministry of Forests, Williams Lake.

Alexander, D 1997. A Cultural Heritage Overview of the Cariboo Forest Region. On file at the Ministry of Forests, Williams Lake.

Allison, S. L. 1970. Allison Pass Memoirs, Part 3. *Canada West*, Vol. 2(2): 20-33. Summerland, BC.

Allison, S. L. 1892. Account of the Similkameen Indians of British Columbia. Journal of the [Royal] Anthropological institute of Great Britain and Ireland. Vol. 21(3): 305-318. London.

Arcas Associates. 1986. *Archaeological Excavations at Valley Mine, Highland Valley, B.C.* 2 vols. Arcas Associates, Port Moody, BC.

Arcas Consulting Archaeologists. 2007. *Okanagan Timber Supply Area Archaeological Overview Assessment*. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Archaeology Branch. 2009. A*rchaeological Overview Assessment as General Land Use Planning Tools—Provincial Standards and Guidelines Review and Management Plan for the Southern Chilliwack Forest District*. Archaeology Branch, Ministry of Forests Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Bennett, Joseph R., B.F. Cumming, P. R. Leavitt, M. Chiu, J.P. Smol, and J. Szeicz. 2001. Diatom, Pollen, and Chemical Evidence of Postglacial Climate Change at Big Lake, South-Central British Columbia, Canada. *Quaternary Research*. Vol. 55: 332-343.

Boas, F. 1891. The Shuswap. Second general report on the Indians of British Columbia, sixth report of the Committee on the north-western Tribes of Canada. In *Report of the 60th Meeting of the British Association of the Advancement of Science*, Part II:551-555.

Boas, F. 1895. The Nicola. Fifth general report on the Indians of British Columbia. In *65th Annual Report of the British Association for the Advancement of Science for 1895*. pp. 522-592, London.

Boas, F. 1899. Summary of the Work of the Committee in British Columbia. In *68th Annual Report of the British Association for the Advancement of Science for 1898.* pp. 667-682, London.

Borden, C. 1951. *Results of a Preliminary Survey of the Nechako Reservoir in West Central B.C*. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC Borden, C. 1952. Results of Archaeological Inspections in Central British Columbia. *Anthropology in British Columbia* 3:44-48.

Bouchard, R. T. and D. I. D. Kennedy. 1984. *Indian Land Use and Occupancy in the Franklin D. Roosevelt Lake Area of Washington State*. Report prepared for the Colville Confederated Tribes, Washington, and the United States Bureau of Reclamation, Seattle, WA.

Cannings, R. and S. Cannings. 1996. *British Columbia: A Natural History.* Greystone Books, Vancouver, BC.

Carl, A. 1972. *Salvage Archaeology at the Stafford Ranch Site (FaRn 3)*. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Cassidy, M. and F. Cassidy. 1980. *Proud Past: A History of the Wet'suwet'en of Moricetown, B.C.* On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Clark-Giesbrecht, J. 1994. *Heritage Lost: A People's History of the Ootsa Lake Region 1905-1955*. Quesnel Lake Publishing, Likely, BC.

Cole, D. and B. Lockner (Eds.) 1989. *The Journals of George Dawson: British Columbia, 1875-1878*. Vol. 1, 1875-1876. University of British Columbia Press, Vancouver, BC.

Coupe, R., A. C. Stewart, and B. M. Wikeem. 1991 Engelmann Spruce - Subalpine Fir Zone. In *Ecosystems of British Columbia*, edited by D. V. Meidinger and J. Pojar. pp. 223-236. Research Branch, BC Ministry of Forests, Victoria BC.

Cumming, B. F., K. R. Laird, J. R. Bennett, J. P. Smol, and A. K. Salomon. 2002. Persistent Millennial-Scale Shifts in Moisture Regimes in Western Canada during the past Six Millennia. *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 99(25): 16117-16121.

Dawson, G.M. 1891. Notes on the Shuswap People of British Columbia. *Transactions of the Royal Society of Canada* 9(2): 3–44.

DeLong, C., R. M. Annas, and A. C. Stewart. 1991 Boreal White and Black Spruce Zone. In *Ecosystems of British Columbia*, edited by D. V. Meidinger and J. Pojar. pp. 237-250. Research Branch, BC Ministry of Forests, Victoria BC.

Donahue, P. 1972. *Preliminary report of excavations at Tezli (FgSd-1), British Columbia.* Permit 1971-0001. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Donahue, P. 1973. Ulkatcho: an archaeological outline. *Syesis* 6:153-178.

Duff, W. 1952 Notes on Carrier Social Organization. *Anthropology in British Columbia* 2:28-34.

Fladmark, K.R. 1976. Punchaw village: a preliminary report: the archaeology of a prehistoric settlement. *Current research reports*, edited by R.L. Carlson. Simon Fraser University Publication 3:19-32.

Fladmark, K.R., Driver, J., and D. Alexander. 1988. The Paleoindian Component at Charlie Lake Cave, British Columbia. *American Antiquity* 53(2): 371-384.

Foit, F.F., Jr., D. G. Gaviin, and F. S Hu. 2004. The Tephra Stratigraphy of Two Lakes in South-Central British Columbia, Canada and its Implications for Mid-late Holocene Volcanic Activity at Glacier Peak and Mount St. Helens, Washington, USA. *Canadian Journal of Earth Sciences.* Vol. 41: 1401-1410.

Fulton, R.J. 1969. *Glacial lake history, southern interior Plateau, British Columbia.* Geological Survey of Canada Mem. 380.

Galloway, J. M., A. M. Lenny and B. F. Cumming. 2011. Hydrological Change in the Central Interior of British Columbia, Canada: Diatom and Pollen Evidence of Millennial-to-Centennial scale change over the Holocene. *Journal of Paleolimnology*. Vol. 45: 183-197.

Hallett D.J. and L.V. Hills. 2006. Holocene Vegetation Dynamics, Fire History, Lake Level and Climate Change in the Kootenay Valley, Southeastern British Columbia, Canada. *Journal of Paleolimnology*, Vol. 35: 351-371.

Harmon, D. W. 1820. *A Journal of Voyages and Travels in the Interior of North America,* Flagg and Gould, Andover.

Harmon, D. W. 1957. *Sixteen Years in Indian Country: The Journal of Daniel William Harmon, 1800–1816*, edited by W. Kaye Lamb. MacMillan Publishing Co., Toronto.

Hebda, R. J. 2007. *Biodiversity: Geological History in British Columbia.* Written for the Biodiversity BC Technical Subcommittee for the Report on the Status of Biodiversity in BC. Electronic resource found at http://www.biodiversitybc.org . Accessed on February 29, 2012.

Hill-Tout, C. 1911. Report on the Ethnology of the Okanák·ēn of British Columbia, an Interior Division of the Salish Stock. *Journal of the [Royal] Anthropological Institute of Great Britain and Ireland*, Vol. 41. pp.130, 137-144, London. (Reprinted 1978: In *The Salish People, Vol. I: The Thompson and the Okanagan*. Edited by Ralph Maud. pp.131-159. Talonbooks, Vancouver, BC.

Hodder, K.R., J.R. Desloges, and R. Gilbert. 2006. Pattern and timing of sediment infill at glacier-fed Mud Lake: implications for late glacial and Holocene environments in the Monashee Mountain region of British Columbia, Canada. *The Holocene* 16(5): 705-716.

Hope, G. D, D. A. Lloyd, W. R. Mitchell, W. R. Erickson, W. L. Harper, and B. M. Wikeem. 1991. Interior Douglas-fir Zone. In *Ecosystems of British Columbia*, edited by D. V. Meidinger and J. Pojar. pp. 153-166. Research Branch, BC Ministry of Forests, Victoria BC.

Hudson, D. 1983. *Traplines and Timber: Social and Economic Change Among the Carrier Indians of Northern British Columbia.* Unpublished Ph.D. Dissertation, Department of Anthropology, University of Alberta, Edmonton, AB.

Hudson, D. 1990. The Okanagan Indians of British Columbia. In *Okanagan Sources*. Edited by Jean Webber and The En'owkin Centre. pp. 54-89, Theytus Books, Penticton, BC.

Ignace, M. and K. Favrholdt. 2017. Trade, Travel, and Transportation. In *Secwépemc People, Land, and Laws*. Montreal, Kingston, London, Chicago: McGill-Queen's University Press.

Ignace, M. 1998. Shuswap. In *Handbook of North American Indians Volume 13*, edited by W. C. Sturtevant, pp. 203-222. Washington: Smithsonian Institute.

Ignace, M, and R. Ignace. (Eds.) 2017. *Secwépemc People, Land, and Laws*. Montreal, Kingston, London, Chicago: McGill-Queen's University Press.

Ignace, R. 2008. *Our Oral Histories are Our Iron Posts: Secwépemc Stories and Historical Consciousness.* Unpublished PhD Dissertation. Simon Fraser University, Department of Sociology and Anthropology.

Johnsen, T. F. and T. A. Brennand. 2004. Late-glacial lakes in the Thompson Basin, British Columbia: paleogeography and evolution. *Canadian Journal of Earth Sciences.* 41: 1367-1383.

Kennedy, D. 1971-1991. [Lillooet ethnographic fieldnotes. Okanagan-Colville ethnographic fieldnotes.] Manuscripts in British Columbia Indian Language Project, Victoria.

Kennedy, D. I. D. and R. T. Bouchard. 1998. Northern Okanagan, Lakes, and Colville. In *Handbook of North American Indians, Volume 12: Plateau*. Edited by Deward E. Walker, Jr. Smithsonian Institution, Washington, D.C.

Kenny, R. 1972. *Preliminary Report Deep Creek Site (FbRn 13).* On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Ketcheson, M. V., T. F. Braumandl, D. V. Meidinger, G. Utzig, D. A. Demarchi, and B. M. Wikeem. 1991. Interior Cedar – Hemlock Zone. In *Ecosystems of British Columbia*, edited by D. V. Meidinger and J. Pojar. pp. 167-182. Research Branch, BC Ministry of Forests, Victoria BC.

Lamb, W. K. 1970. *The Letters and Journals of Sir Alexander Mackenzie*. The Haklyut Society, London, UK.

Lane, R. B. 1981. Chilcotin. In *Subarctic*, edited by June Helm, pp. 402-412. Handbook of North American Indians, vol. 6, William C. Sturtevant, general editor. Smithsonian Institution Press, Washington, DC.

Mathewes R.W. and G.E. Rouse. 1975. Palynology and Paleoecology of Postglacial sediments from the Lower Fraser River Canyon of British Columbia. *Canadian Journal of Earth Sciences*, Vol.12: 745-756.

Meidinger D. V., J. Pojar and W. L. Harper. 1991. Sub-Boreal Spruce Zone. In *Ecosystems of British Columbia*, edited by D. V. Meidinger and J. Pojar. pp. 209-222. Research Branch, BC Ministry of Forests, Victoria BC.

Mitchell, D. S. 1925. *A Story of the Fraser River's Great Sockeye Runs and their loss: Being part of a local history written for my neighbours of the Shuswaps*. Manuscript on file with Fisheries and Oceans Canada.

Montgomery, P. 1979. *The Blackwater drainage study, a heritage inventory project in the vicinity of Quesnel, BC.* Permit 1979-0022. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Morice, A. G. 1978 *The History of the Northern Interior of British Columbia*. Ye Galleon Press, Fairfield, WA.

Province of British Columbia. 1996. *Heritage Conservation Act.* Electronic resource found at: http://www.bclaws.ca/Recon/document/ID/freeside/00_96187_01

Rousseau, M. 1993. Early Prehistoric Occupation of South-Central British Columbia: A Review of the Evidence and Recommendations for Future Research. *BC Studies* 99:140-183.

Ryder, June M. and J. J. Clague. 1989. British Columbia (Quaternary Stratigraphy and History, Cordilleran Ice Sheet). In *Quaternary Geology of Canada and Greenland*, edited by R.J. Fulton, pp. 48-58. Geological Survey of Canada, Ottawa, ON.

Sanger, D. 1969. Cultural traditions in the interior of British Columbia. *Syesis* 2:189-200.

Teit, J. 1900. The Thompson Indians of British Columbia. In *Memoirs of the American Museum of Natural History 2, Anthropology* 1(4); *Publications of the Jesup North Pacific Expedition* 1(4). New York. (Reprinted: AMS Press, New York, 1975; also, Nicola Valley Museum Archives Association, Merritt, BC, 1997, from a volume originally owned and annotated by James A. Teit.).

Teit, J. 1900–1921. [Thompson ethnographic notes.] Manuscripts in the American Philosophical Society Library, Philadelphia.

Teit, J. 1909. The Shuswap. In *Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition* 2(7):447–789.

Teit, J. 1930. The Salishan Tribes of the Western Plateaus. In *the Forty-Fifth Annual Report of the Bureau of American Ethnology*, Washington, DC.

Tobey, M. 1981. Carrier. In *Subarctic*, edited by June Helm, pp. 413-432. Handbook of North American Indians, vol. 6, William C. Sturtevant, general editor. Smithsonian Institution Press, Washington, DC.

Turner, N. J., R. T. Bouchard, and D. I.D. Kennedy. 1980. Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington. *British Columbia Provincial Museum. Occasional Paper* 21. Victoria, BC

Turner, N. J., M. Ignace, and R. Ignace. 2000. Traditional Ecological Knowledge and Wisdom of Aboriginal Peoples in British Columbia. *Ecological Applications*, Vol. 10, No. 5. (October): 1275-1287.

Whitlam, R. 1976. Archaeology in the Williams Lake Area, British Columbia. *Occasional Papers of the Archaeological Sites Advisory Board, No. 1*.

Williams, J. 1974. *Preliminary Report: Salvage Archaeology at the Boitanio Park Site (FaRm 8)*. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Wilson, I.R., K. Twohig, and B. Dahlstrom. 1998. *Archaeological Overview Assessment Northern Secwepemc Traditional Territory*. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Wilson, P. and J. Helmer. 1974. *The Punchaw Lake site (FiRs-1): a progress report on the 1974 field season.* Permit 1974-0020. On file at the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Victoria, BC.

Wyatt, D. 1998. Nicola. In *Handbook of North American Indians, Volume 12: Plateau*. Edited by Deward E. Walker, Jr. pp. 220-222. Smithsonian Institution, Washington, DC.

Yamaguchi, D.K. 1983. New tree ring dates for recent eruptions of Mount St. Helens. *Quaternary Research*, Vol. 20: 23-36.

APPENDIX A

Set 1 Lateral Results Figures

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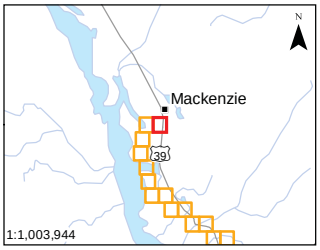

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Forest Tenure Road
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve

Project Areas
Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-1

Title
MAC LTL 168

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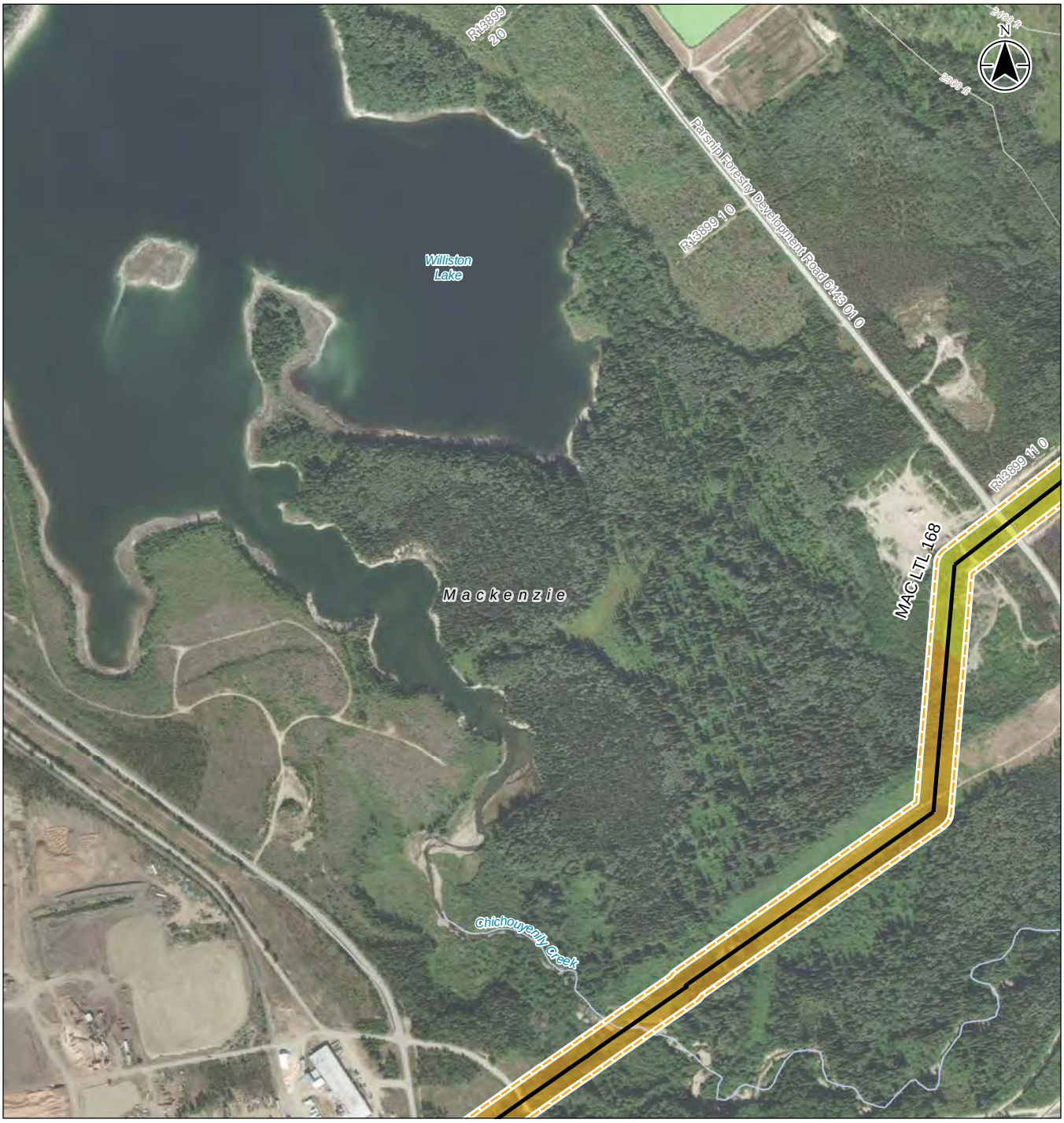

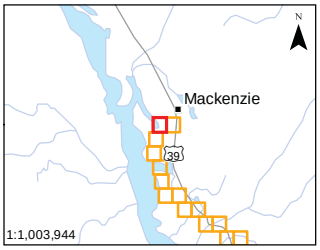

Notes
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2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Forest Tenure Road
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

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Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-2

Title
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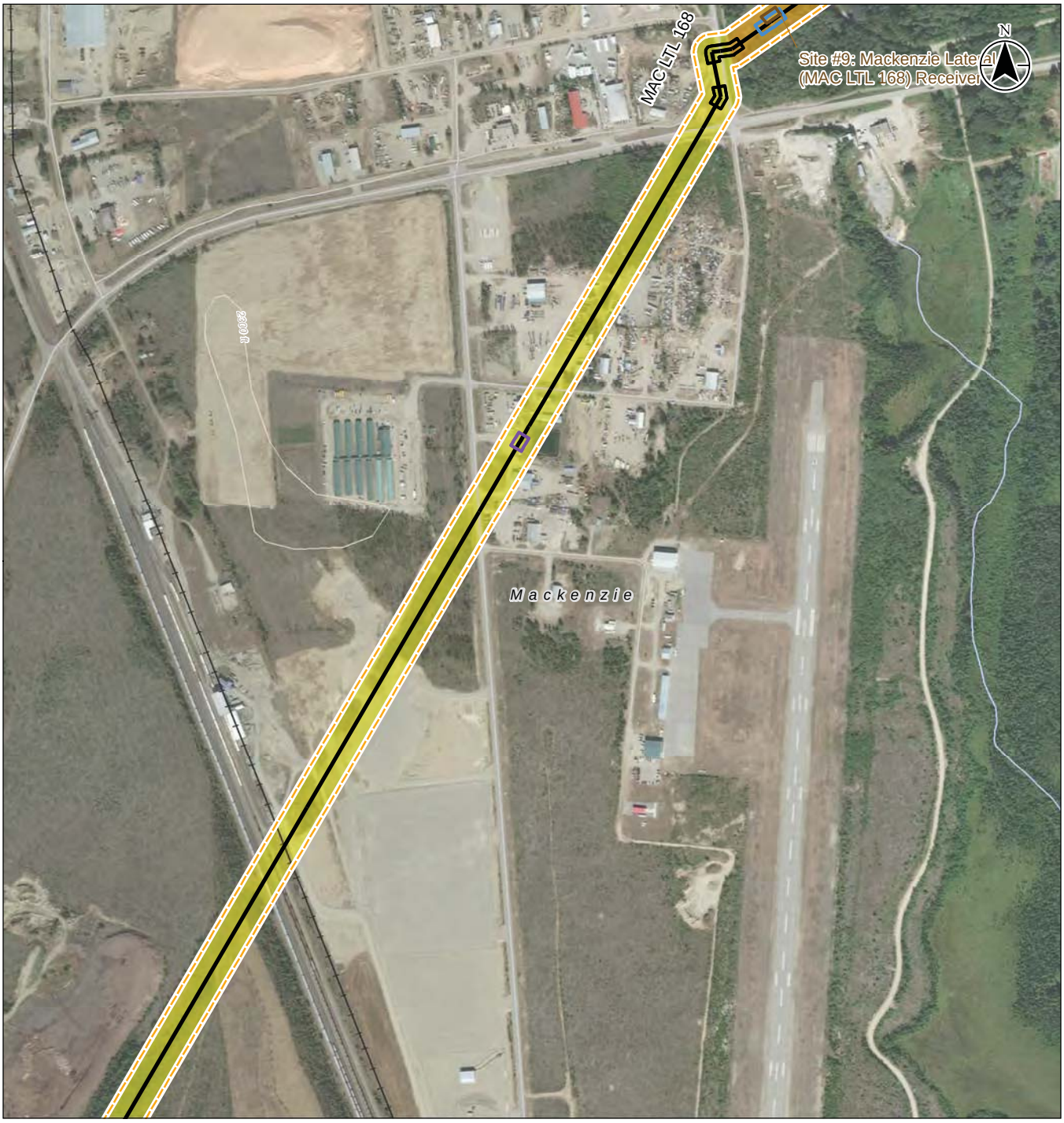

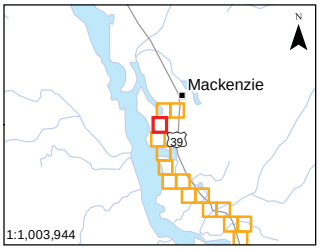

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Local Street
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary

Project Areas

- Lateral
- Study Area
- Facility
- Bend Zone
- Stopper Zone
- Valve Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-3

Title
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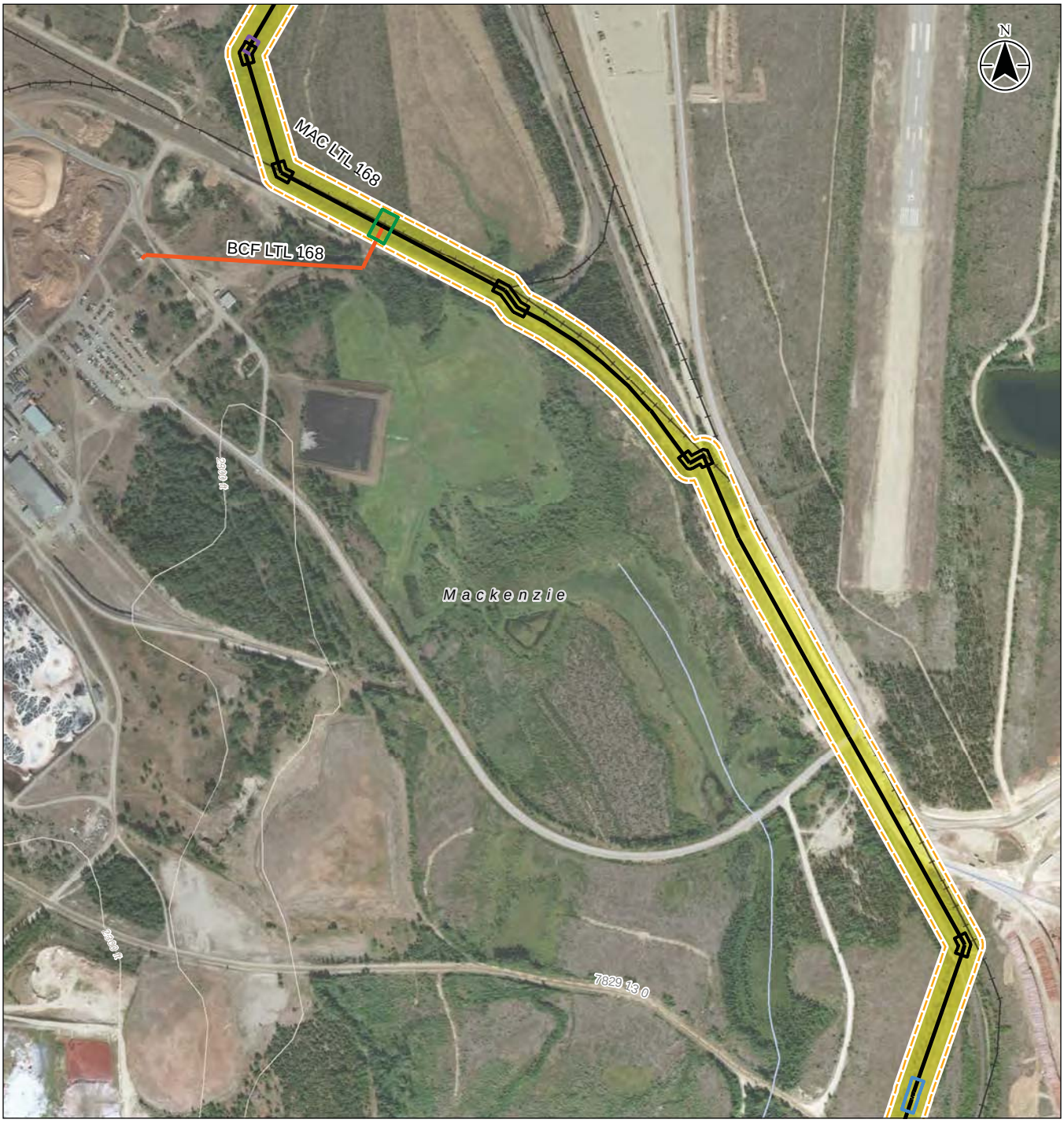

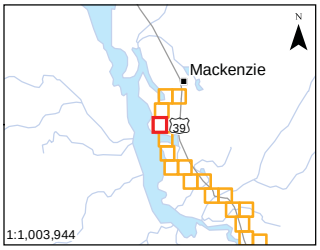

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Local Street
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone
- Stopper Zone
- Tee Zone
- Valve Zone

AOA Results

- Low Potential - Desktop review only

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Stantec FORTIS BC

Project Location

Project Number 123221089
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Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-4

Title
MAC LTL 168

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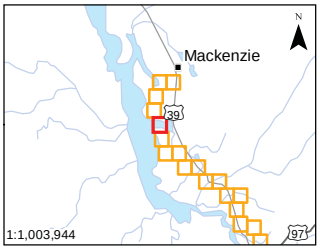

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Watercourse
Municipal Boundary

Project Areas

Lateral
Study Area
Bend Zone

AOA Results

High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

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Stantec FORTIS BC

Project Location

Project Number 123221089
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Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-5

Title
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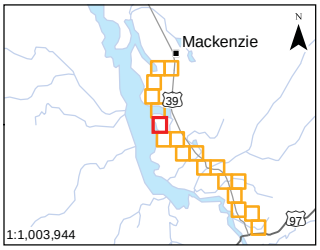

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3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Topographic Contour
Municipal Boundary

Project Areas

Lateral
Study Area
Bend Zone

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-6

Title
MAC LTL 168

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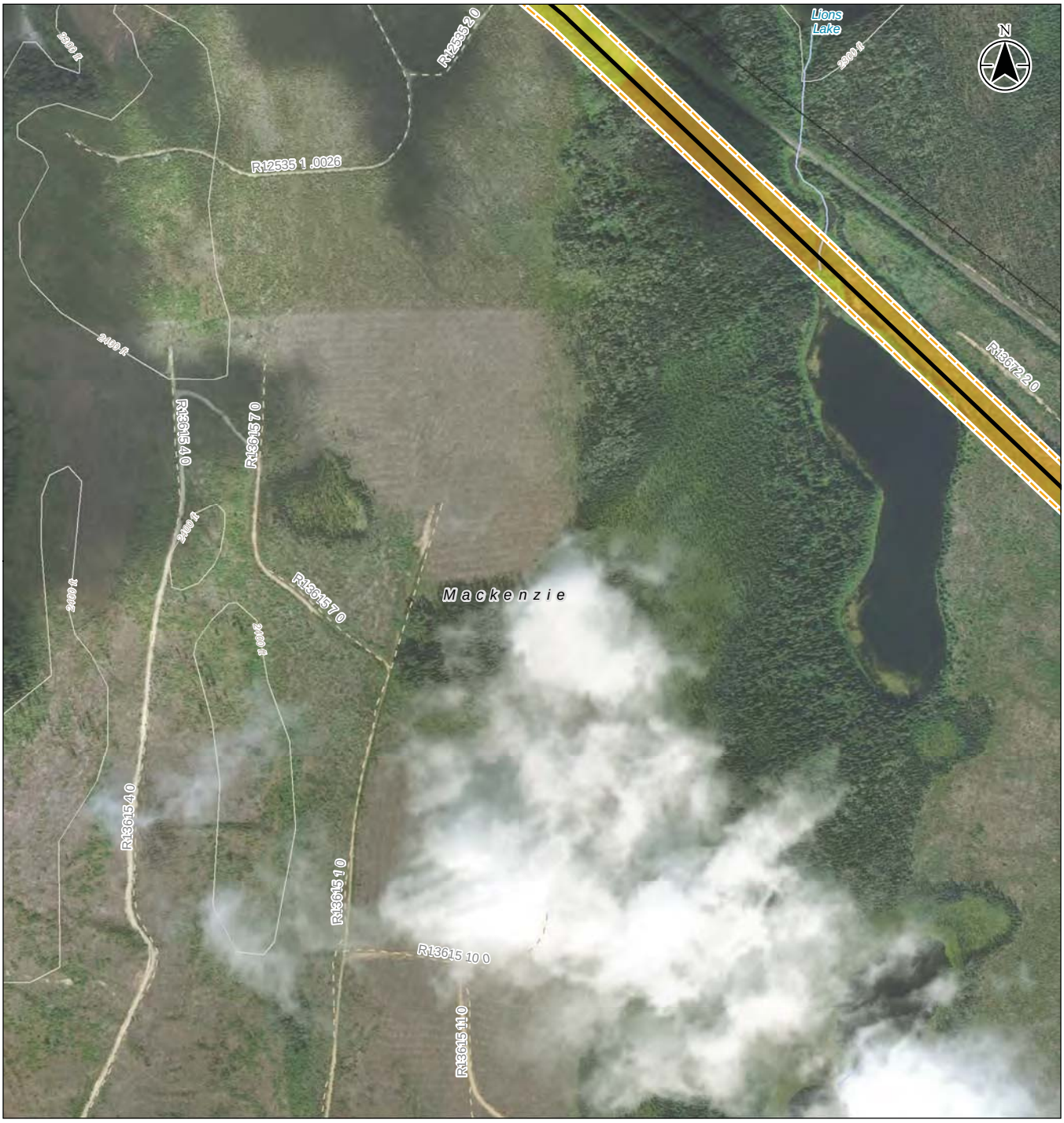

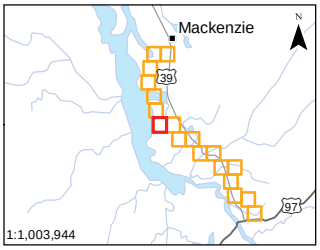

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-7

Title
MAC LTL 168

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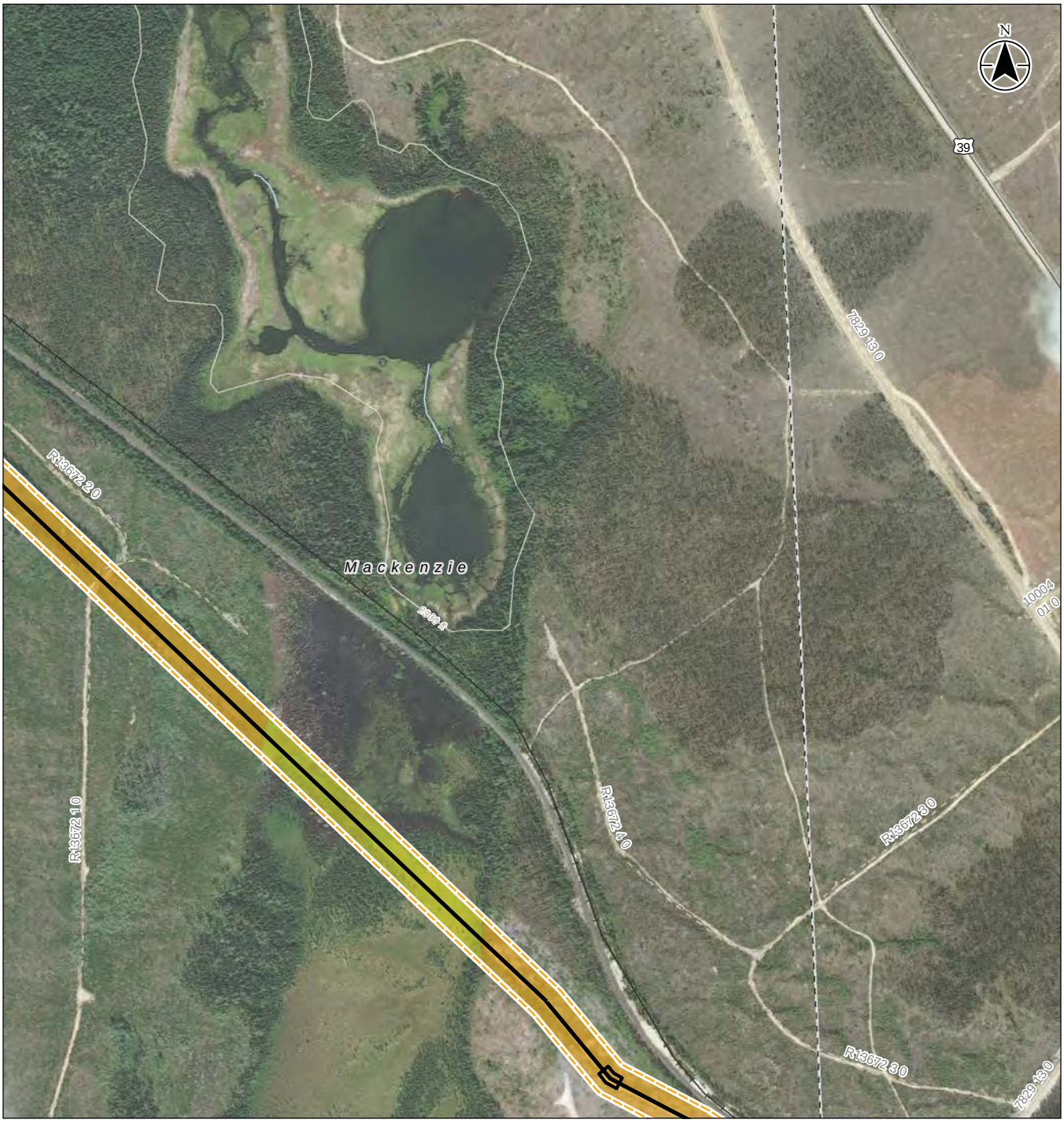

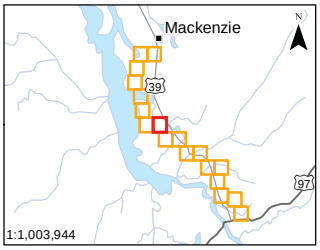

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-8

Title
MAC LTL 168

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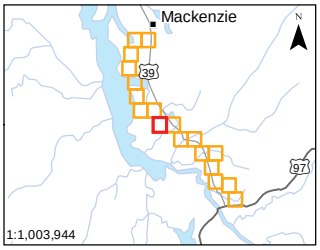

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas

Lateral
Study Area

AOA Results

High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-9

Title
MAC LTL 168

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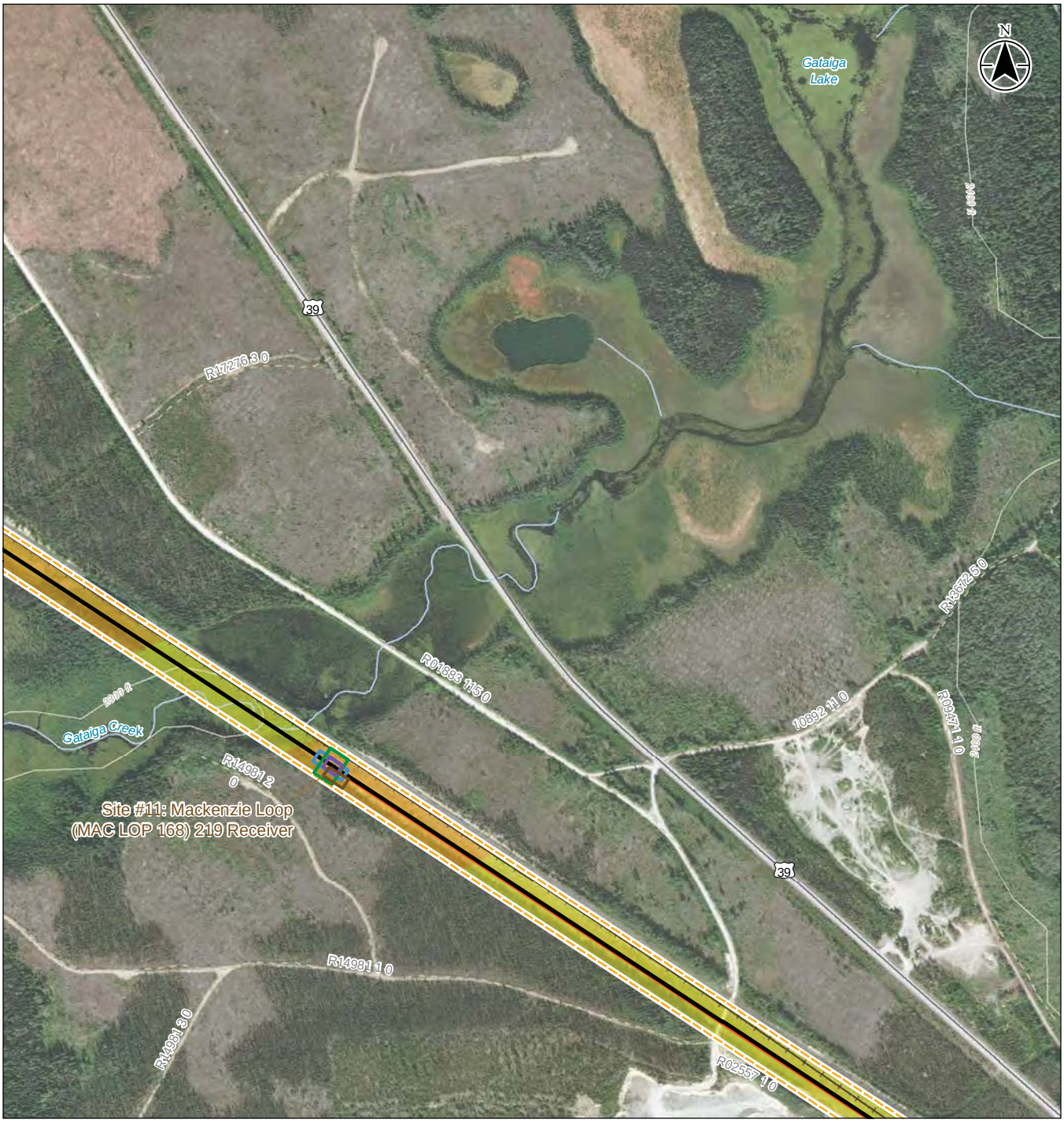

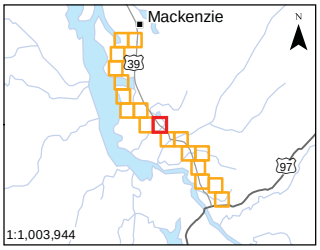

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Facility
Stopper Zone
Tee Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-10

Title
MAC LTL 168

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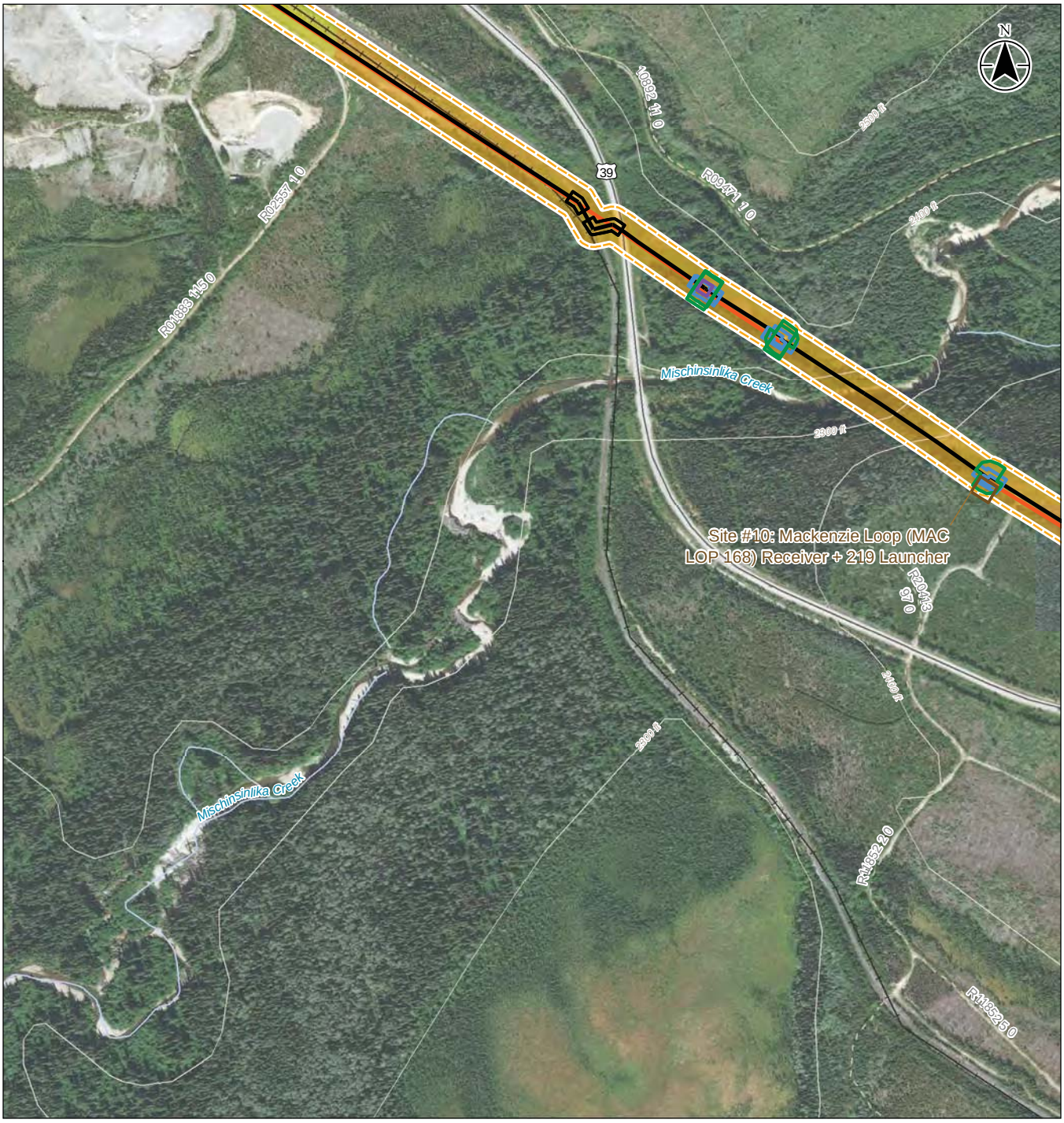

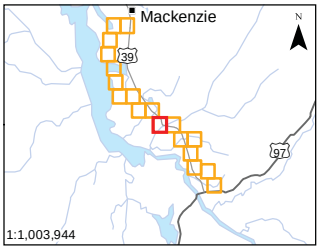

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Facility
Bend Zone
Stopper Zone

Tee Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-11

Title
MAC LTL 168

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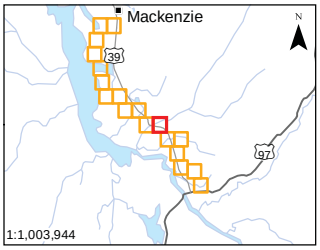

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-12

Title
MAC LTL 168

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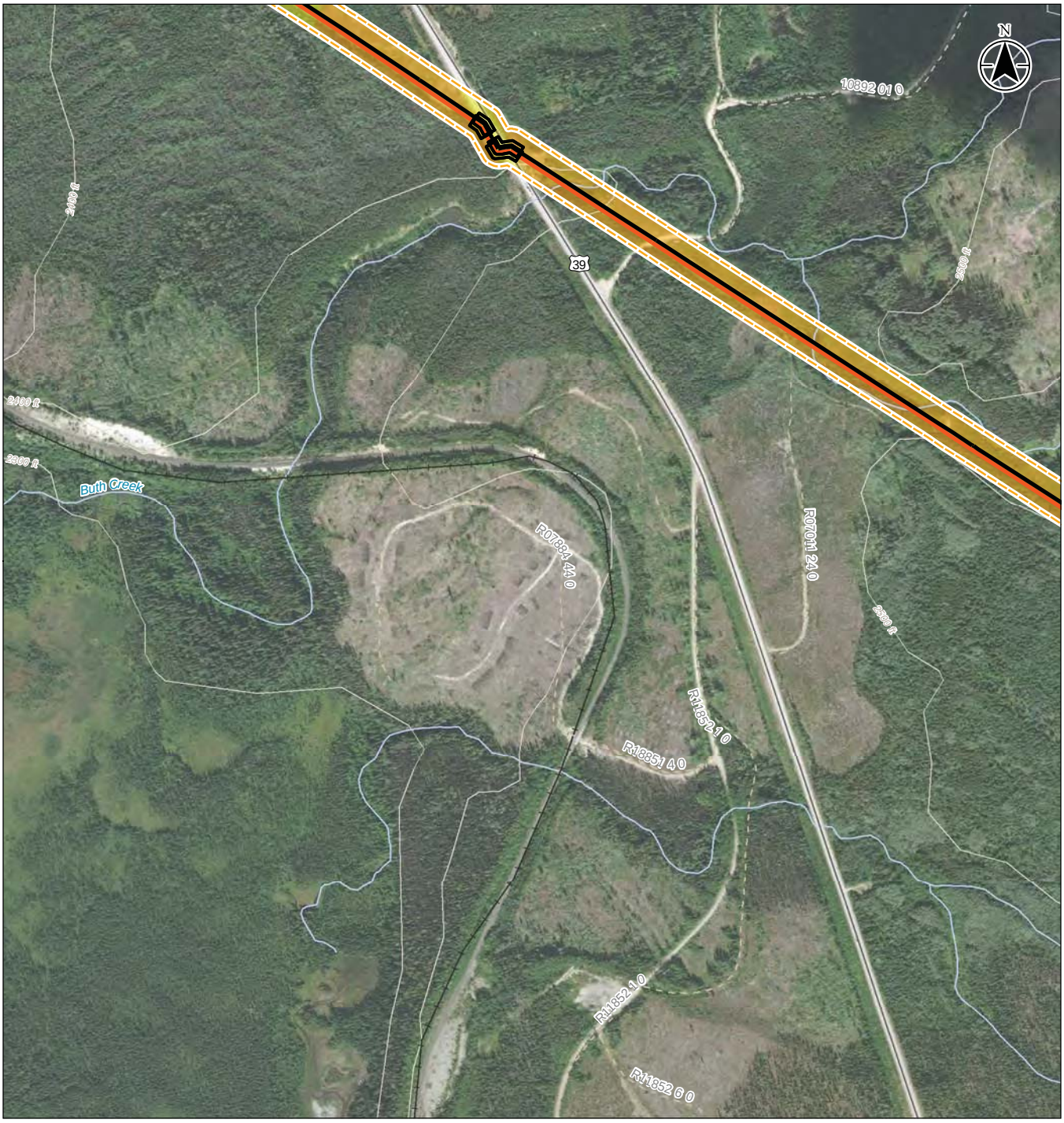

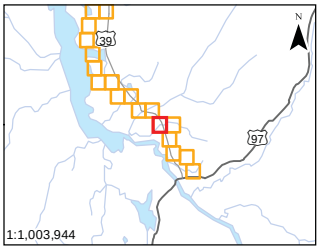

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-13

Title
MAC LTL 168

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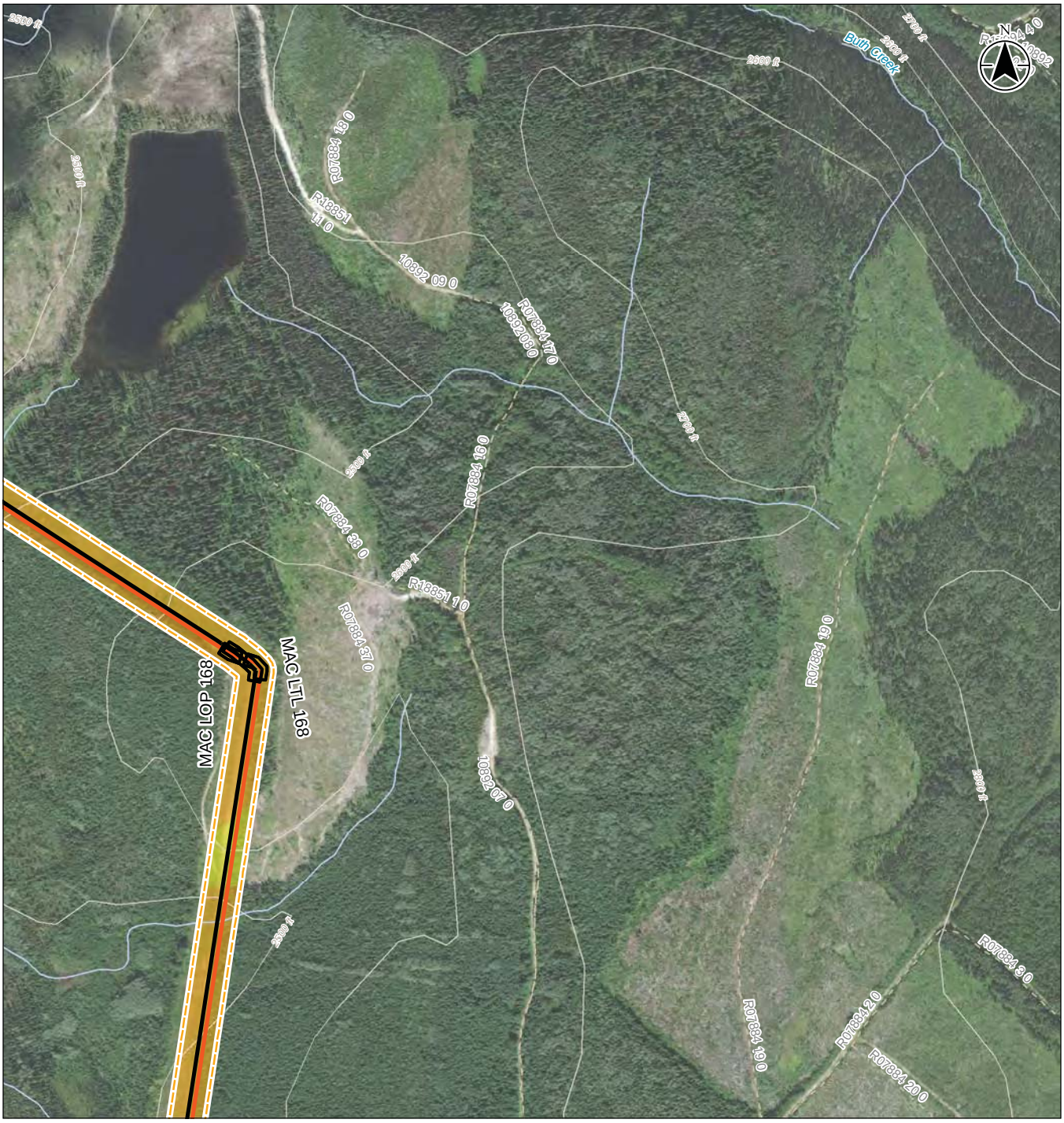

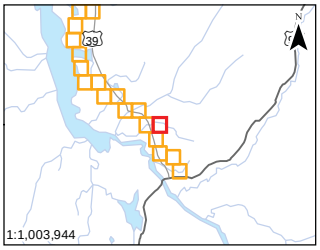

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-14

Title
MAC LTL 168

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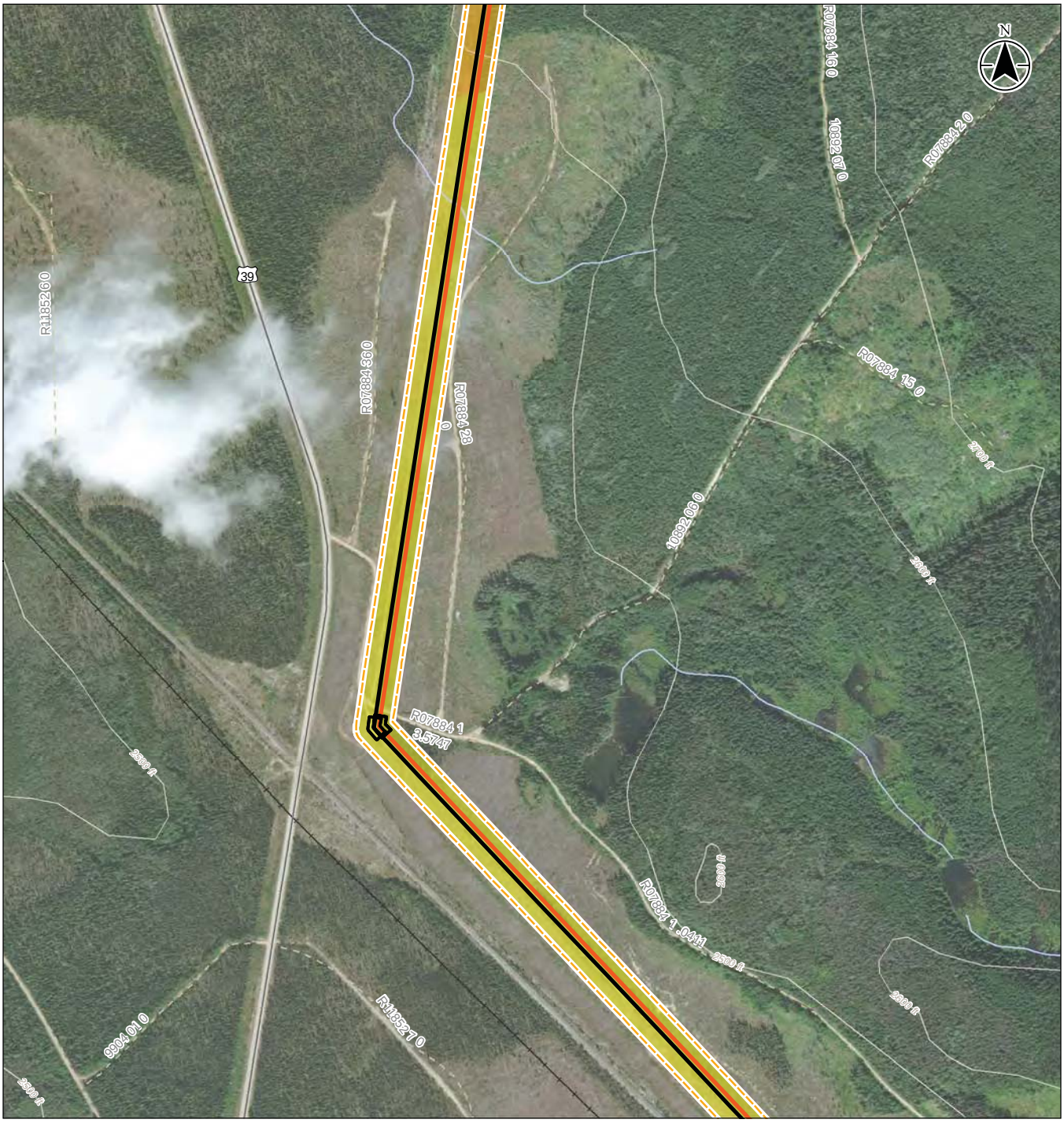

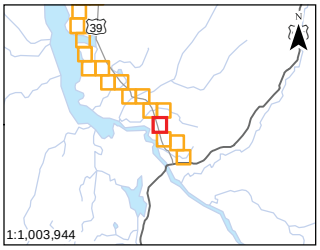

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse

Project Areas
- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone

AOA Results
- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-15

Title
MAC LTL 168

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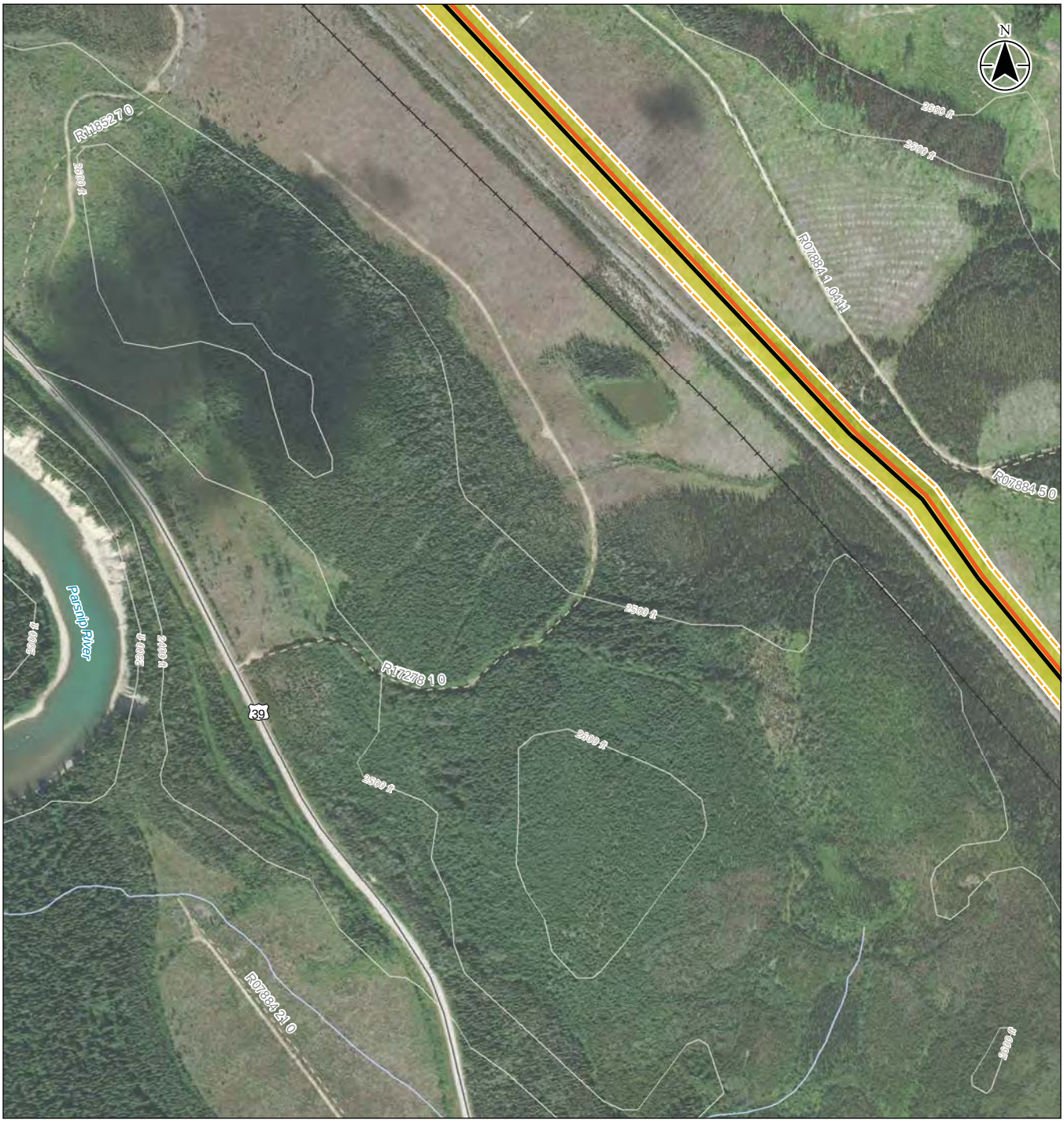

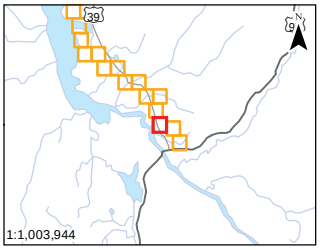

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas

Lateral
Other Fortis Lateral
Study Area

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-16

Title
MAC LTL 168

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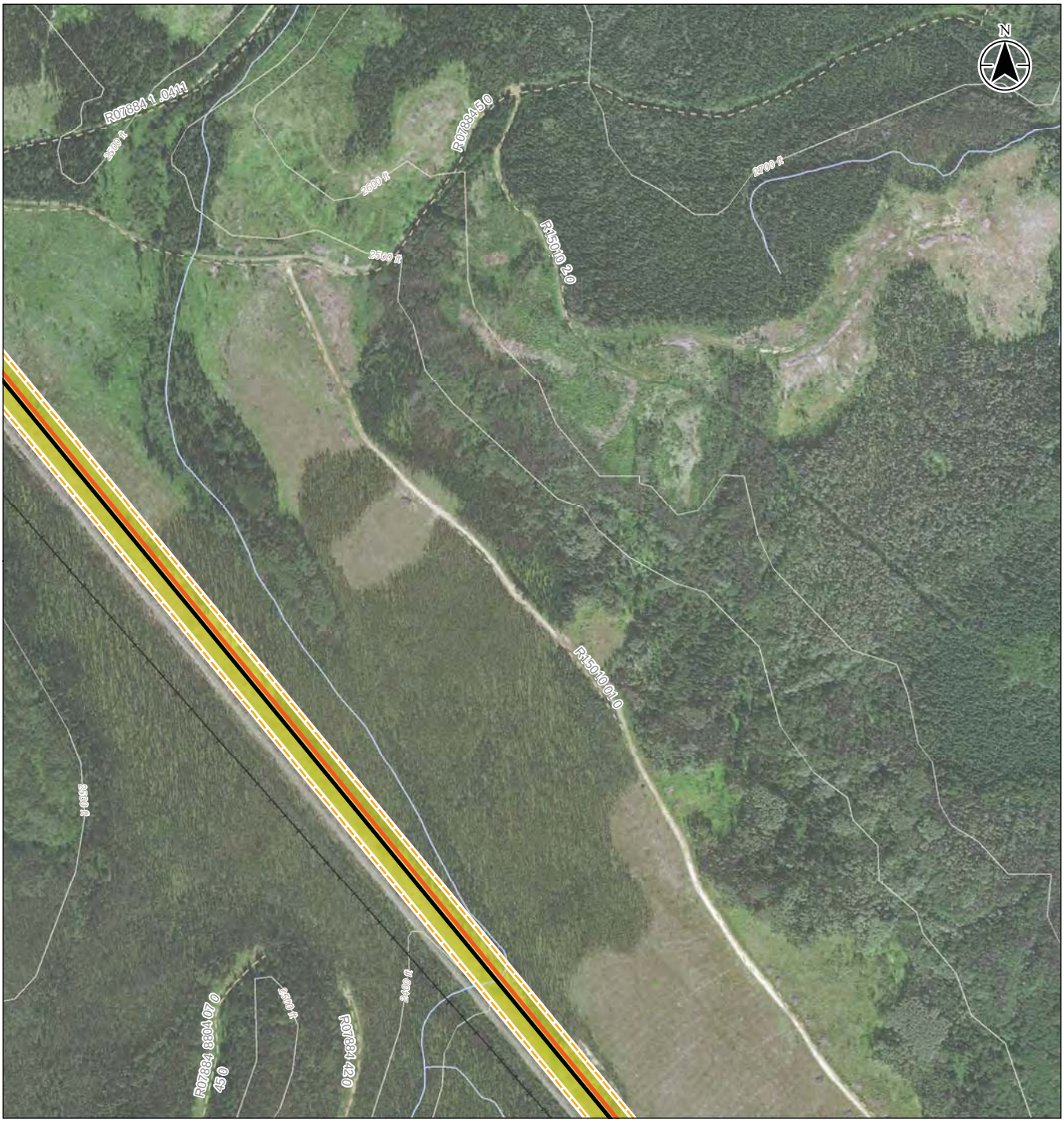

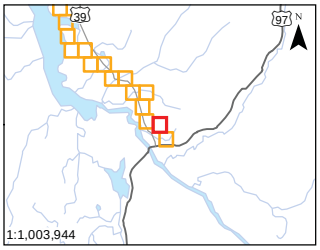

Notes
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3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas

Lateral
Other Fortis Lateral
Study Area

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-17

Title
MAC LTL 168

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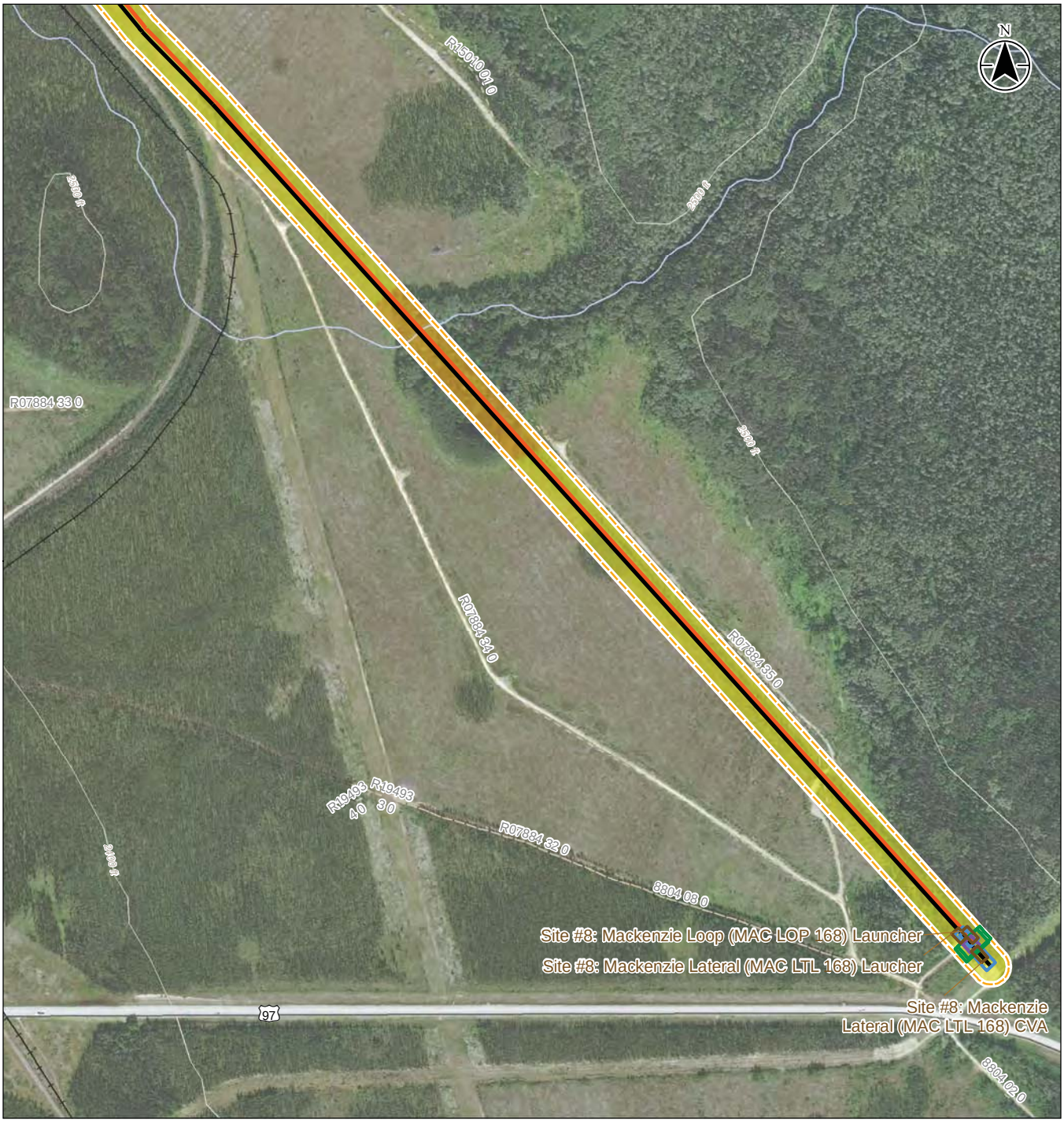

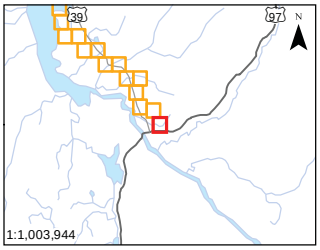

Notes
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2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Facility
Stopper Zone
Tee Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.1-18

Title
MAC LTL 168

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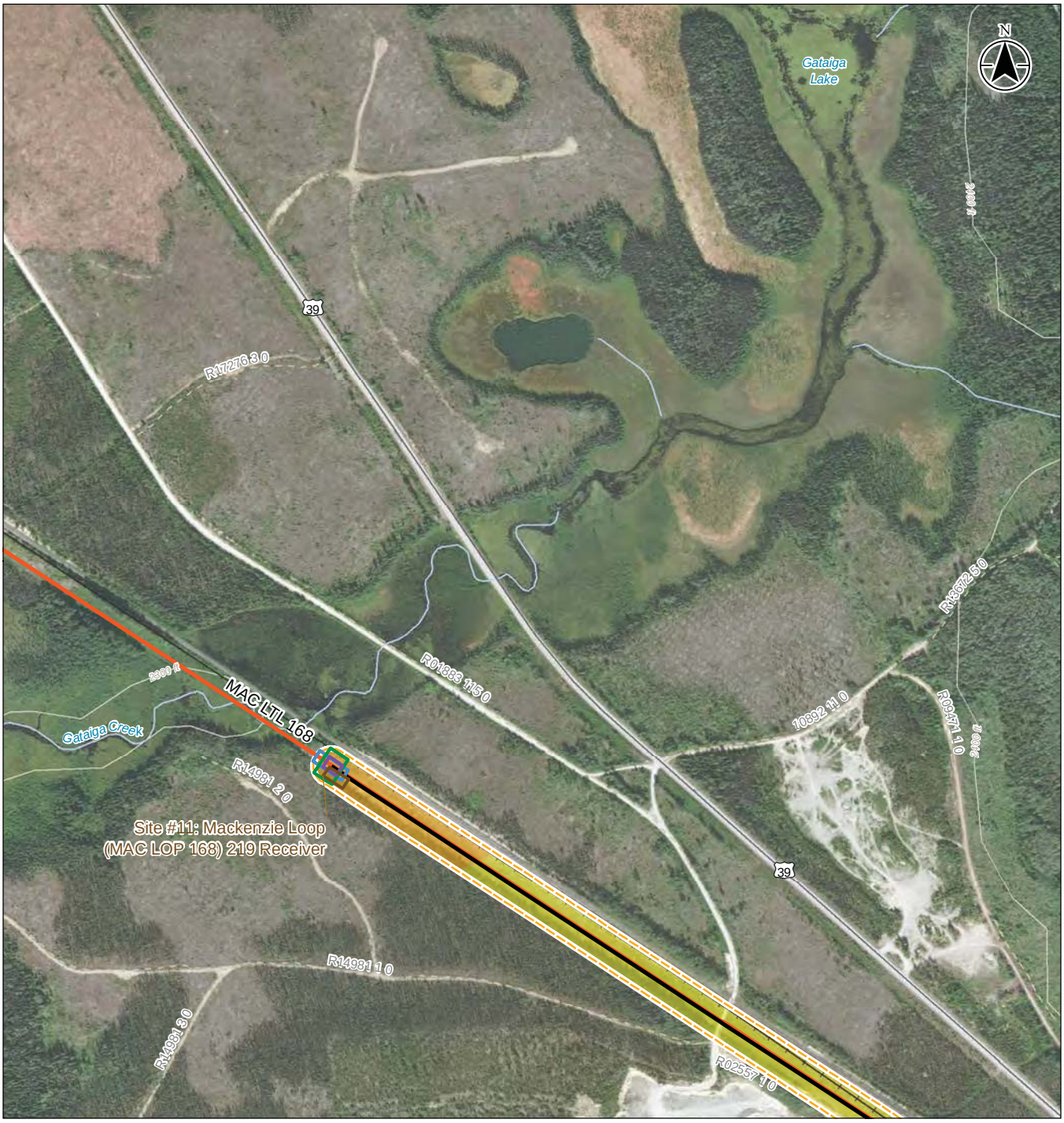

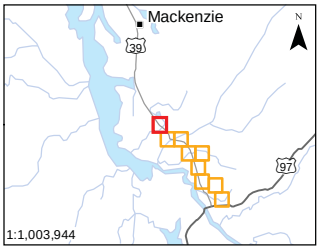

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Facility
Stopper Zone
Tee Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-1

Title
MAC LOP 168

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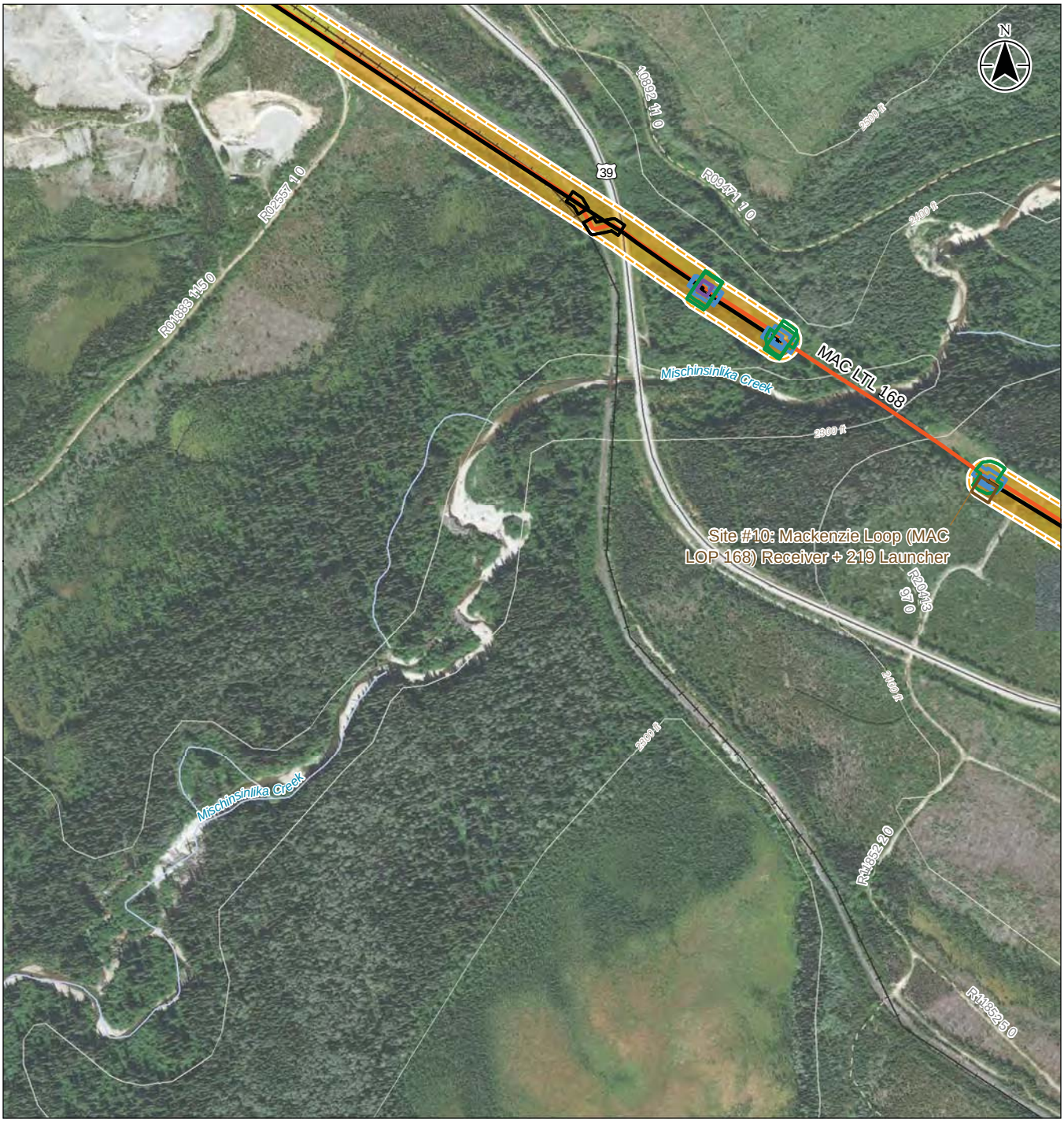

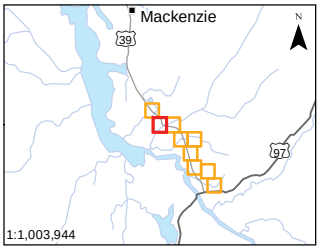

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse

Project Areas
- Lateral
- Other Fortis Lateral
- Study Area
- Facility
- Bend Zone
- Stopper Zone
- Tee Zone
- Valve Zone

AOA Results
- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-2

Title
MAC LOP 168

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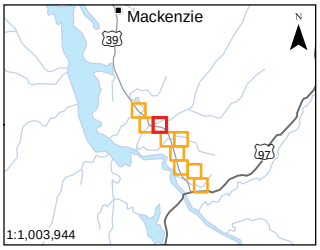

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-3

Title
MAC LOP 168

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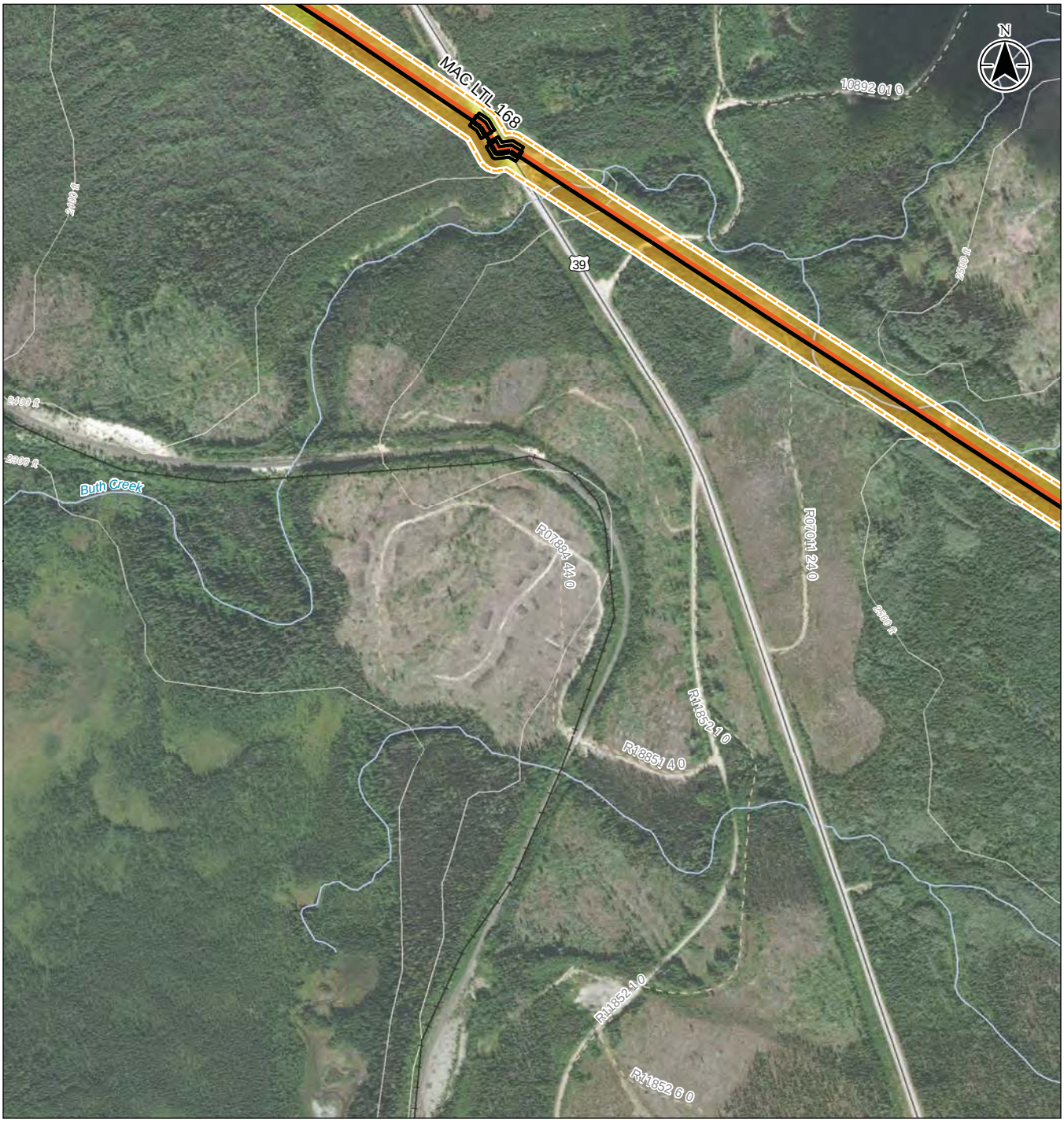

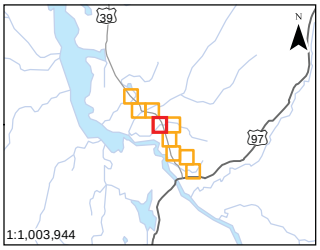

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-4

Title
MAC LOP 168

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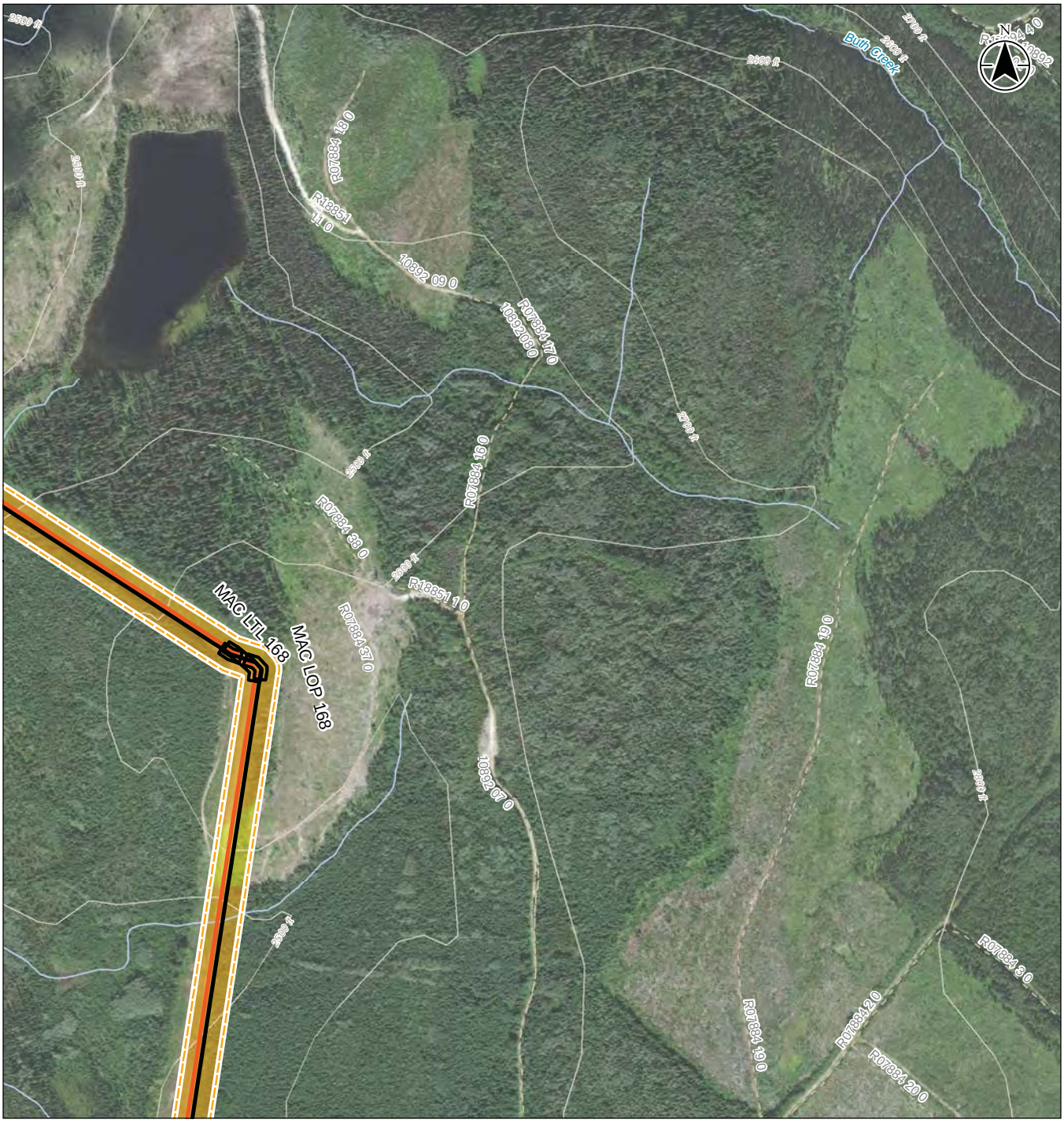

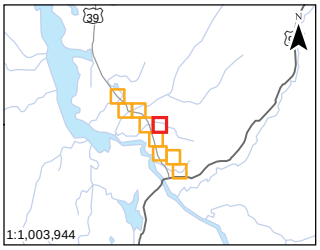

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-5

Title
MAC LOP 168

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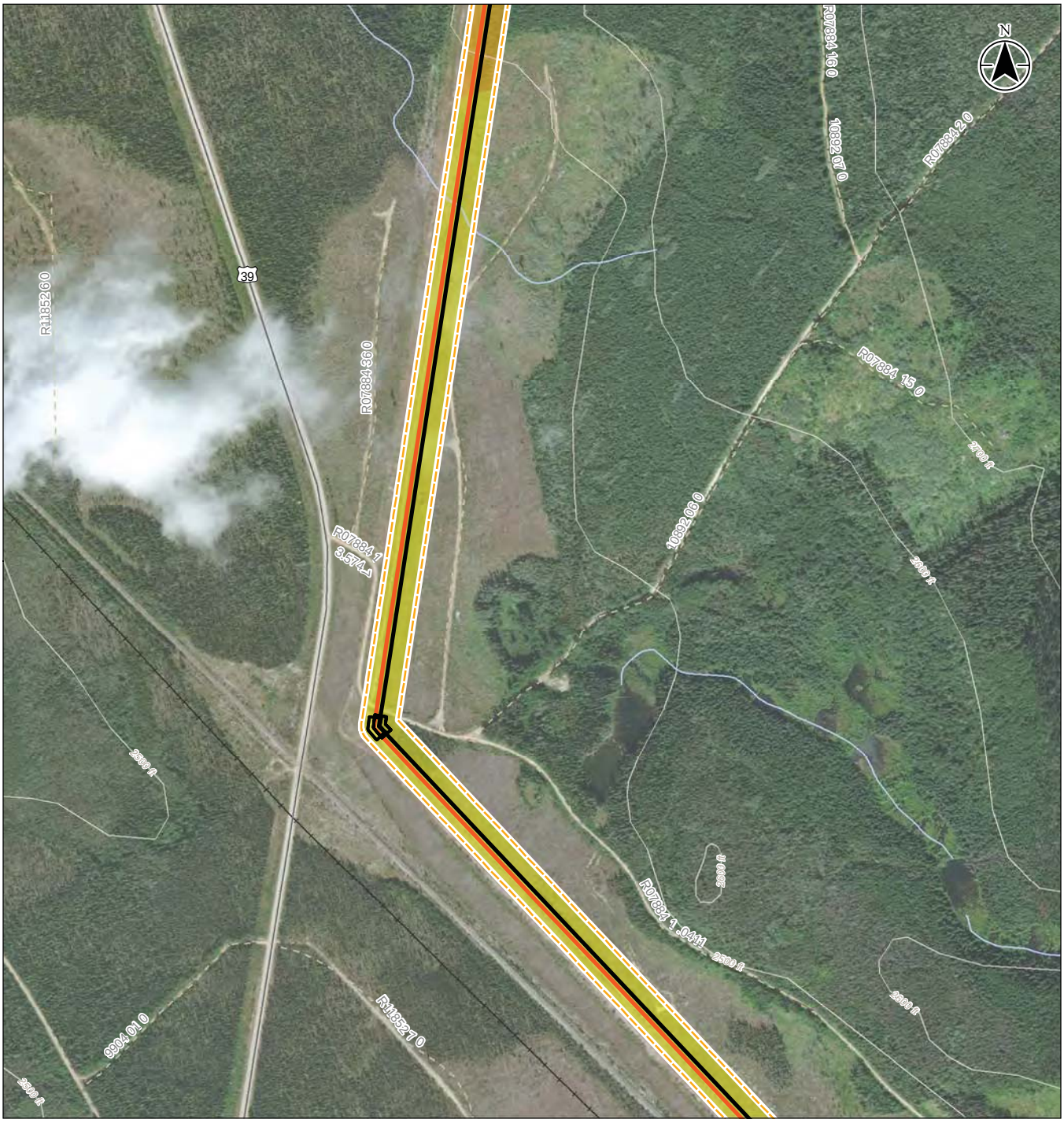

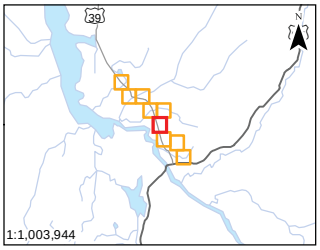

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-6

Title
MAC LOP 168

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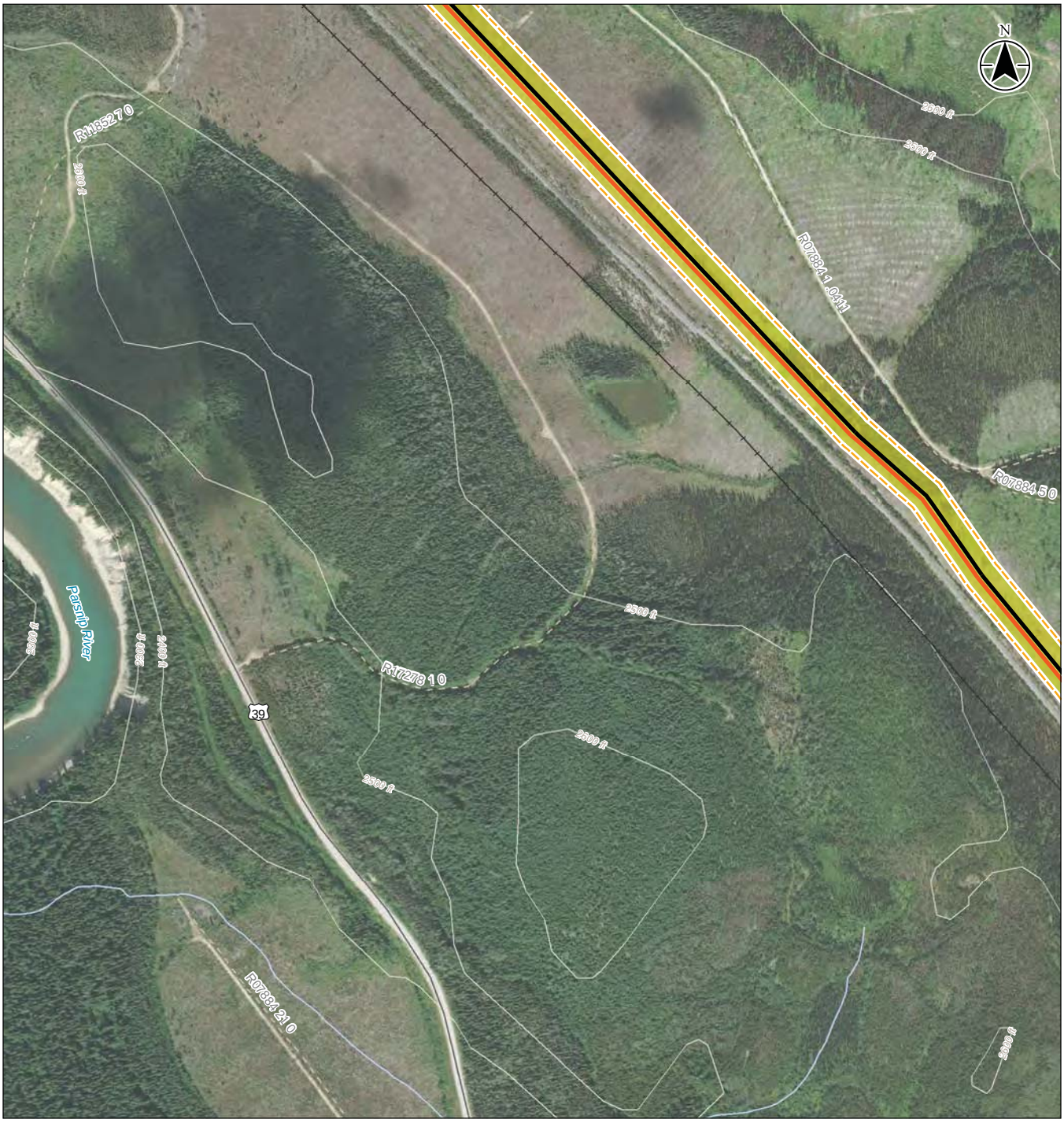

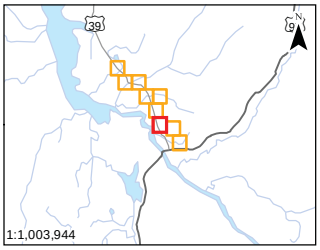

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas

Lateral
Other Fortis Lateral
Study Area

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-7

Title
MAC LOP 168

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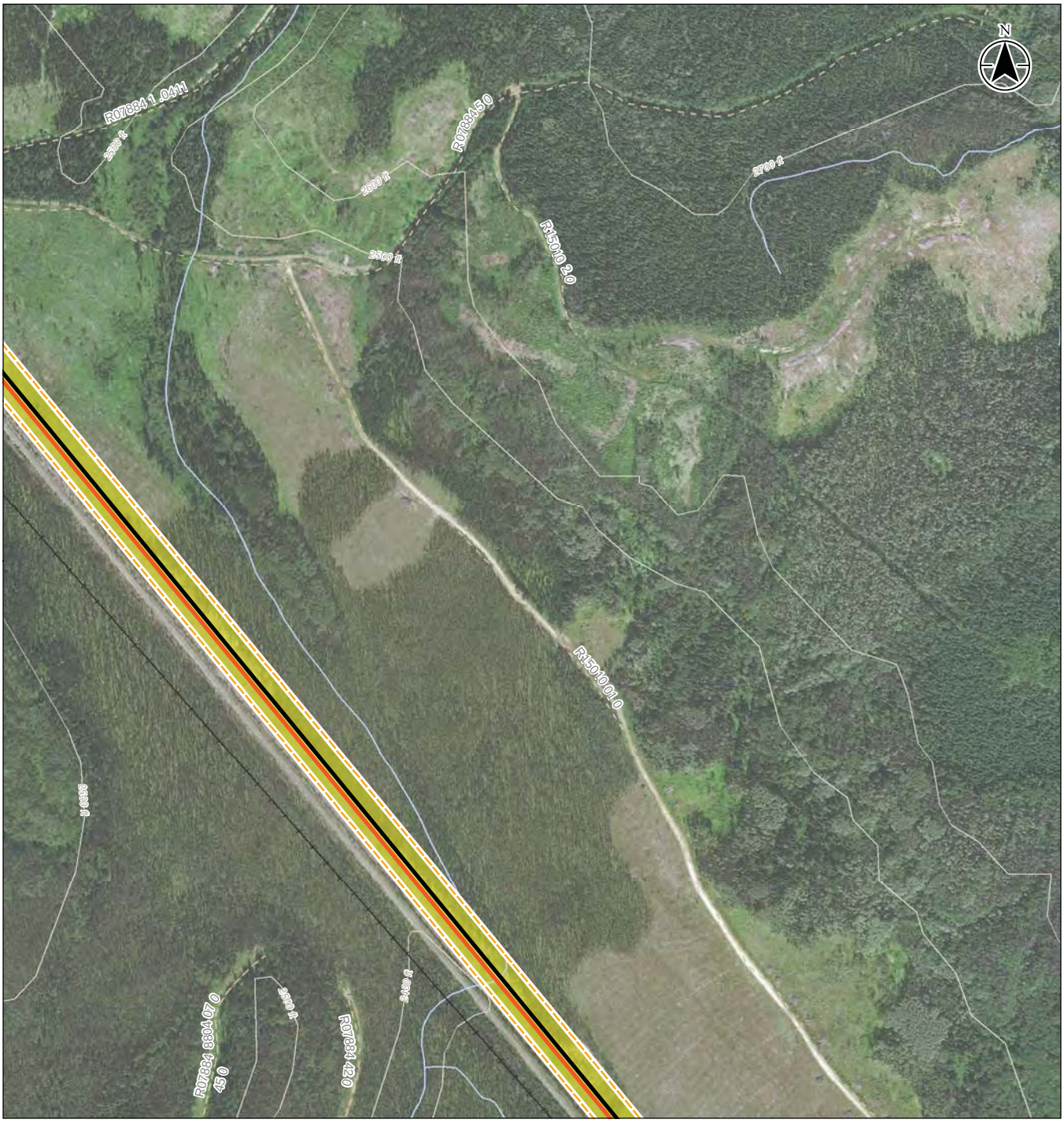

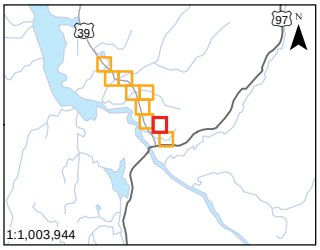

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Railway
Topographic Contour
Watercourse

Project Areas

Lateral
Other Fortis Lateral
Study Area

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-8

Title
MAC LOP 168

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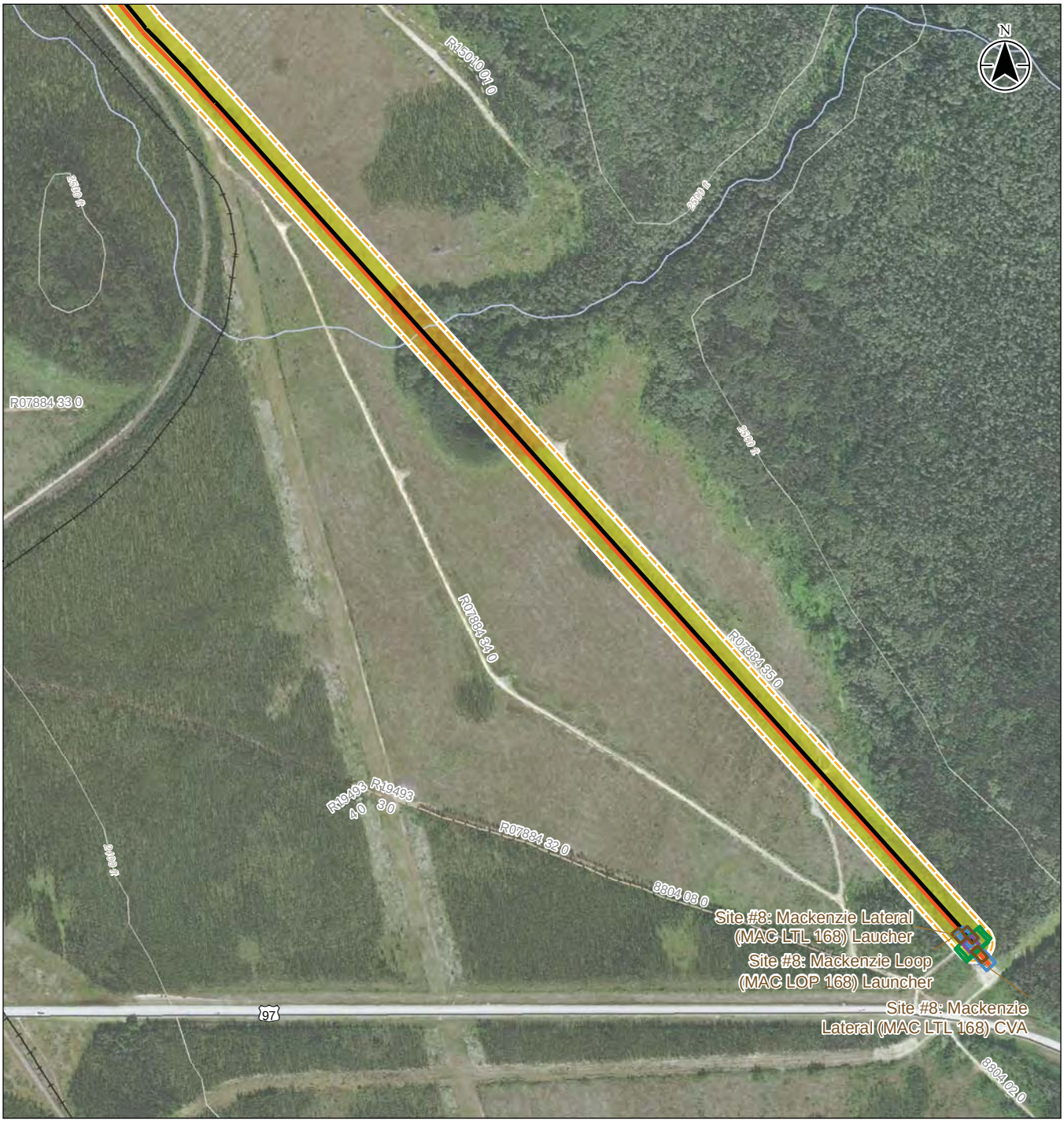

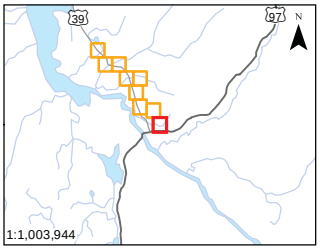

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Forest Tenure Road
- Railway
- Topographic Contour
- Watercourse

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Facility
- Stopper Zone
- Tee Zone
- Valve Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.2-9

Title
MAC LOP 168

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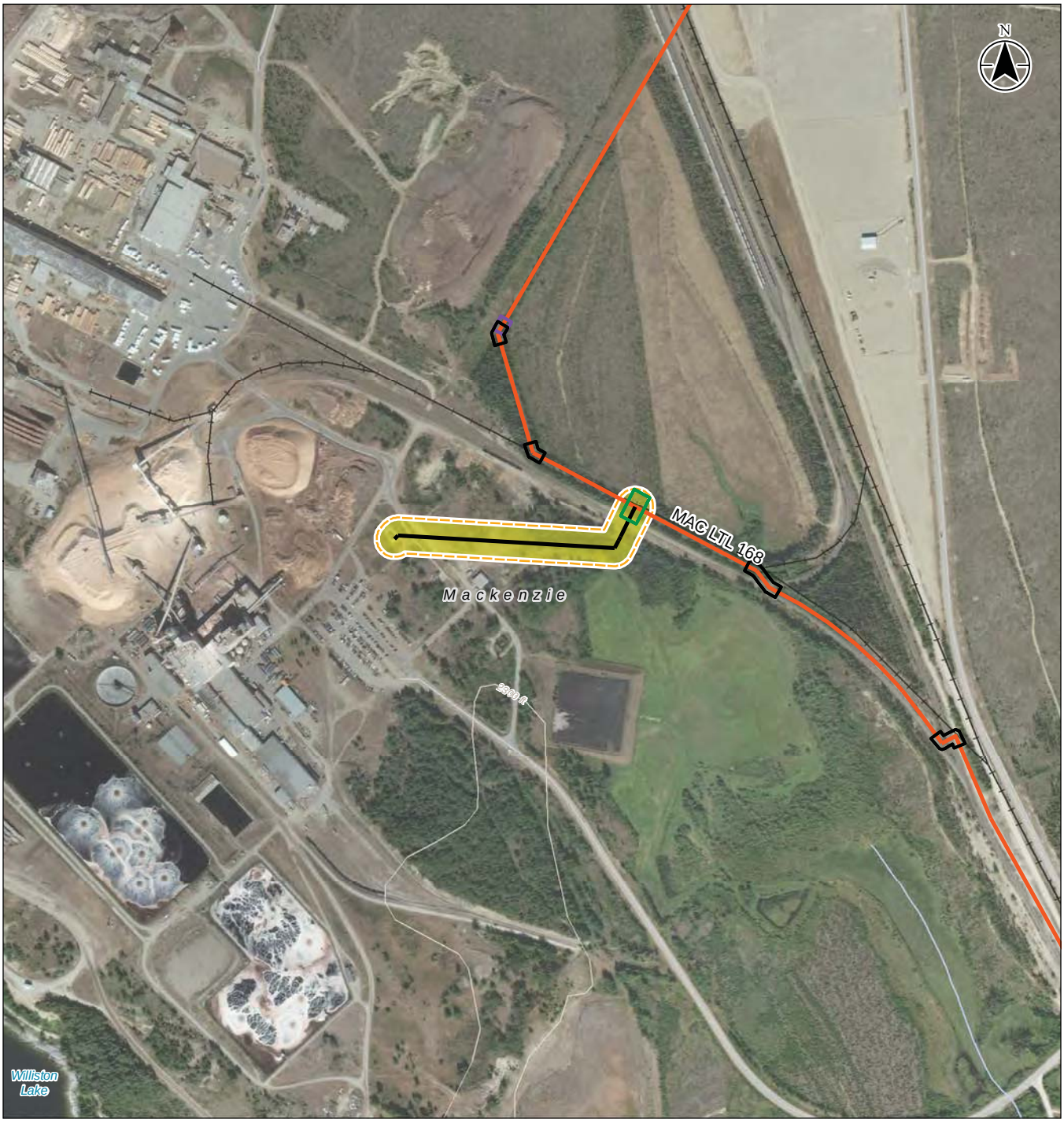

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone
Stopper Zone
Tee Zone

AOA Results
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.3-1

Title
BCF LTL 168

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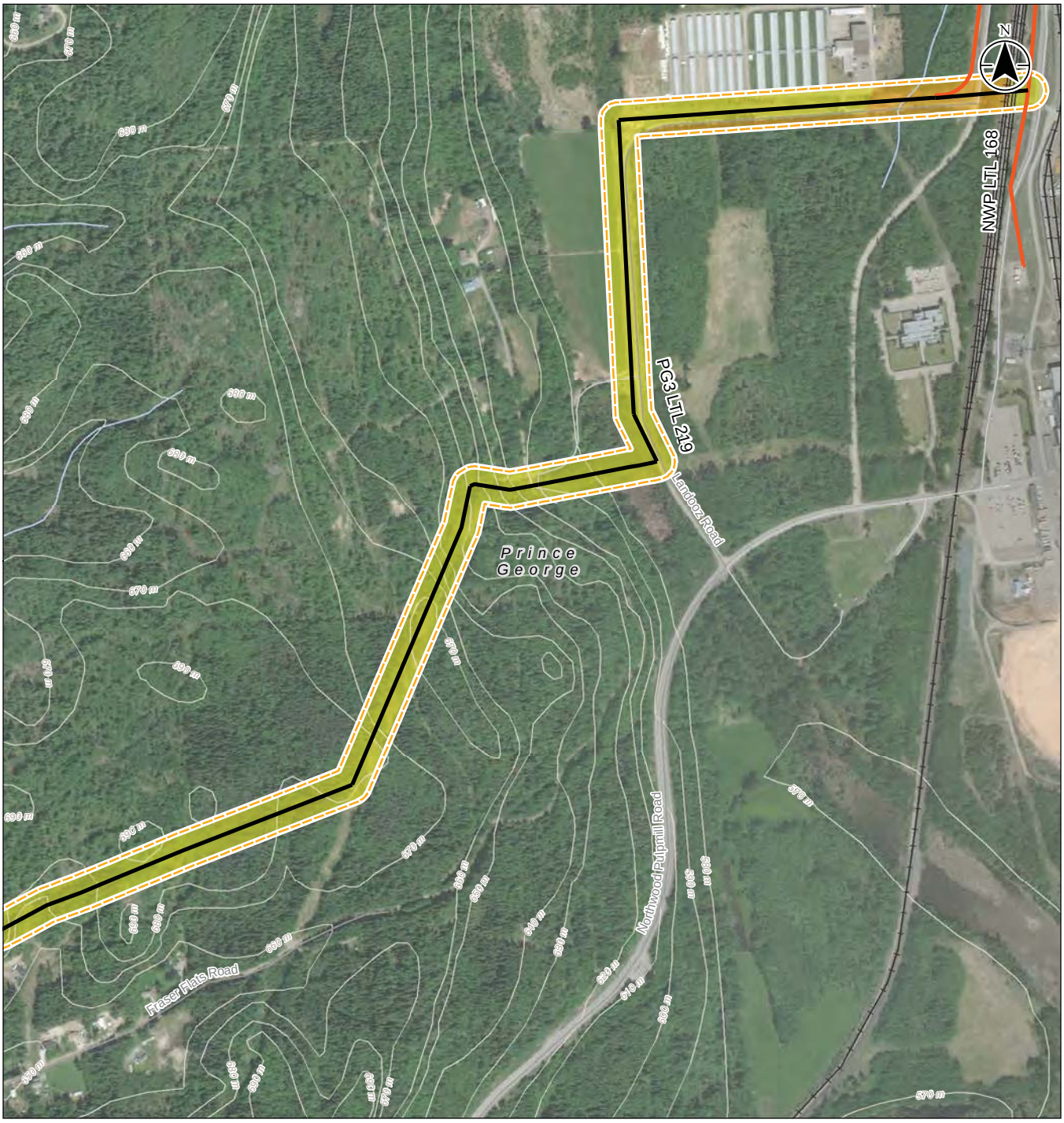

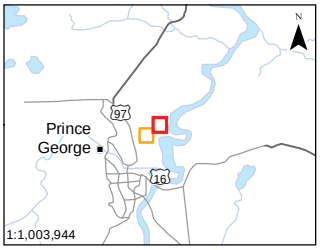

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.4-1

Title
PG3 LTL 219

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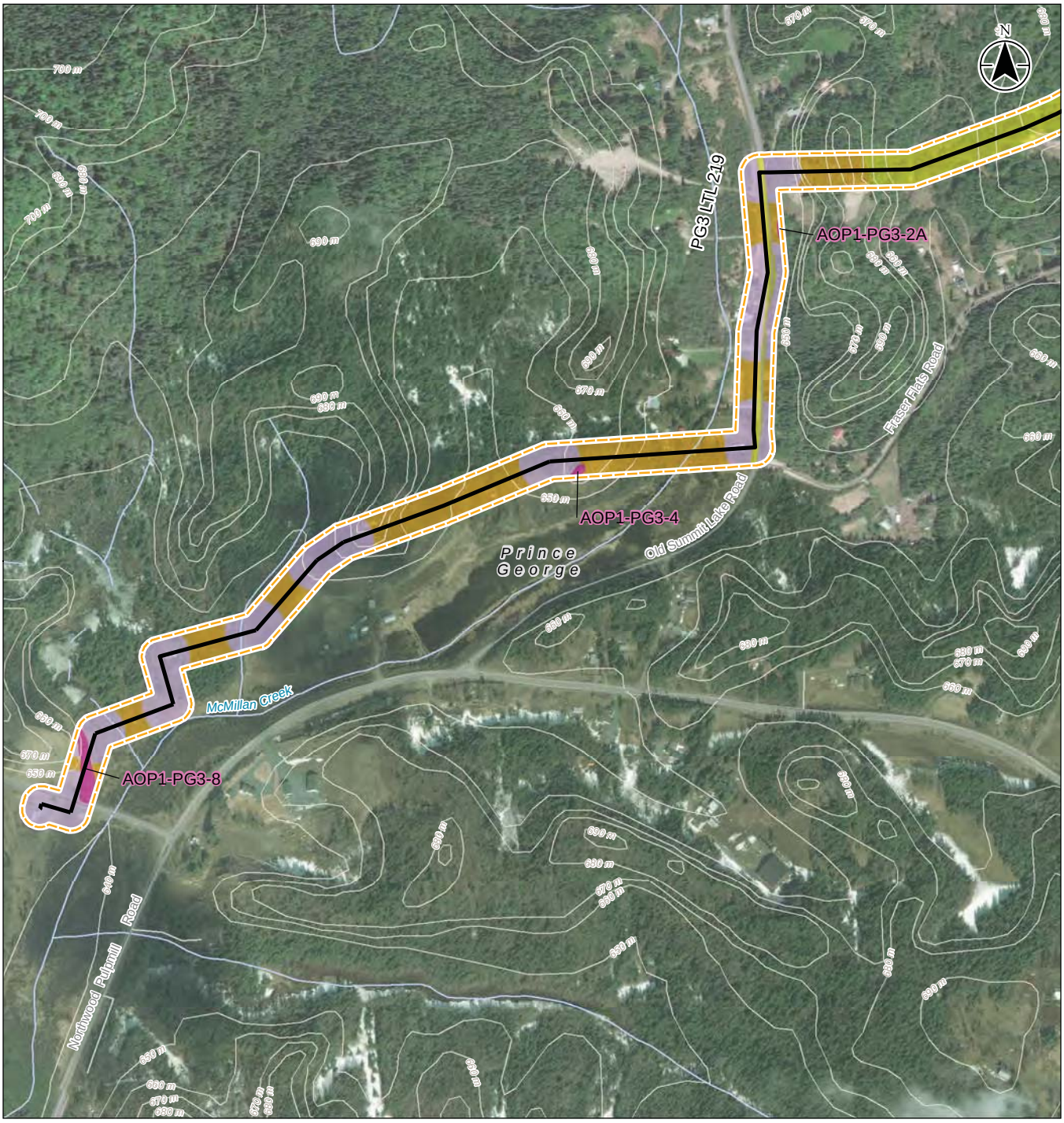

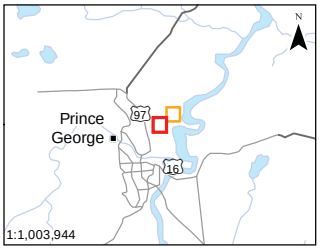

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Road
- Local Street
- Topographic Contour
- Watercourse
- Municipal Boundary

Project Areas

- Lateral
- Study Area

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only
- High Potential - PFR confirmed
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.4-2

Title
PG3 LTL 219

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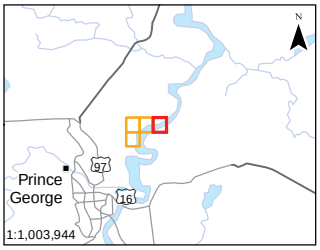

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Road
- Local Street
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary
- First Nations Reserve

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Facility

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.5-1

Title
NWP LTL 168

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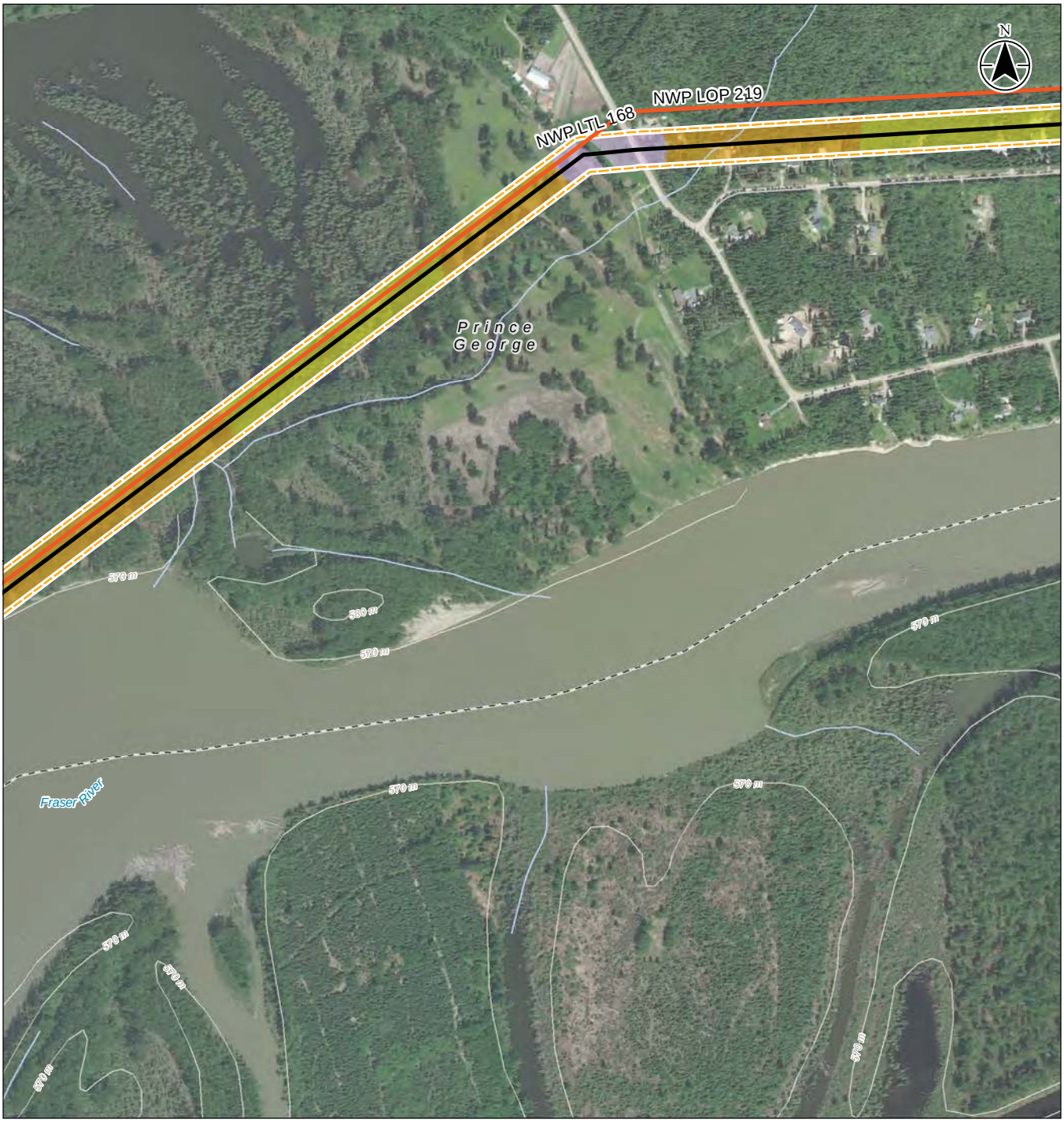

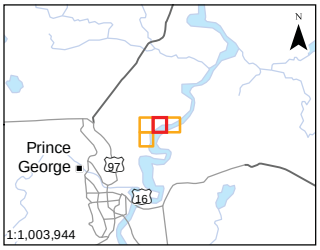

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.5-2

Title
NWP LTL 168

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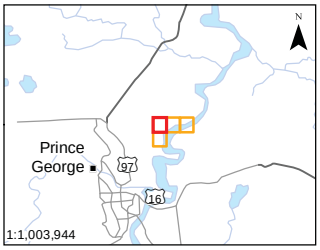

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.5-3

Title
NWP LTL 168

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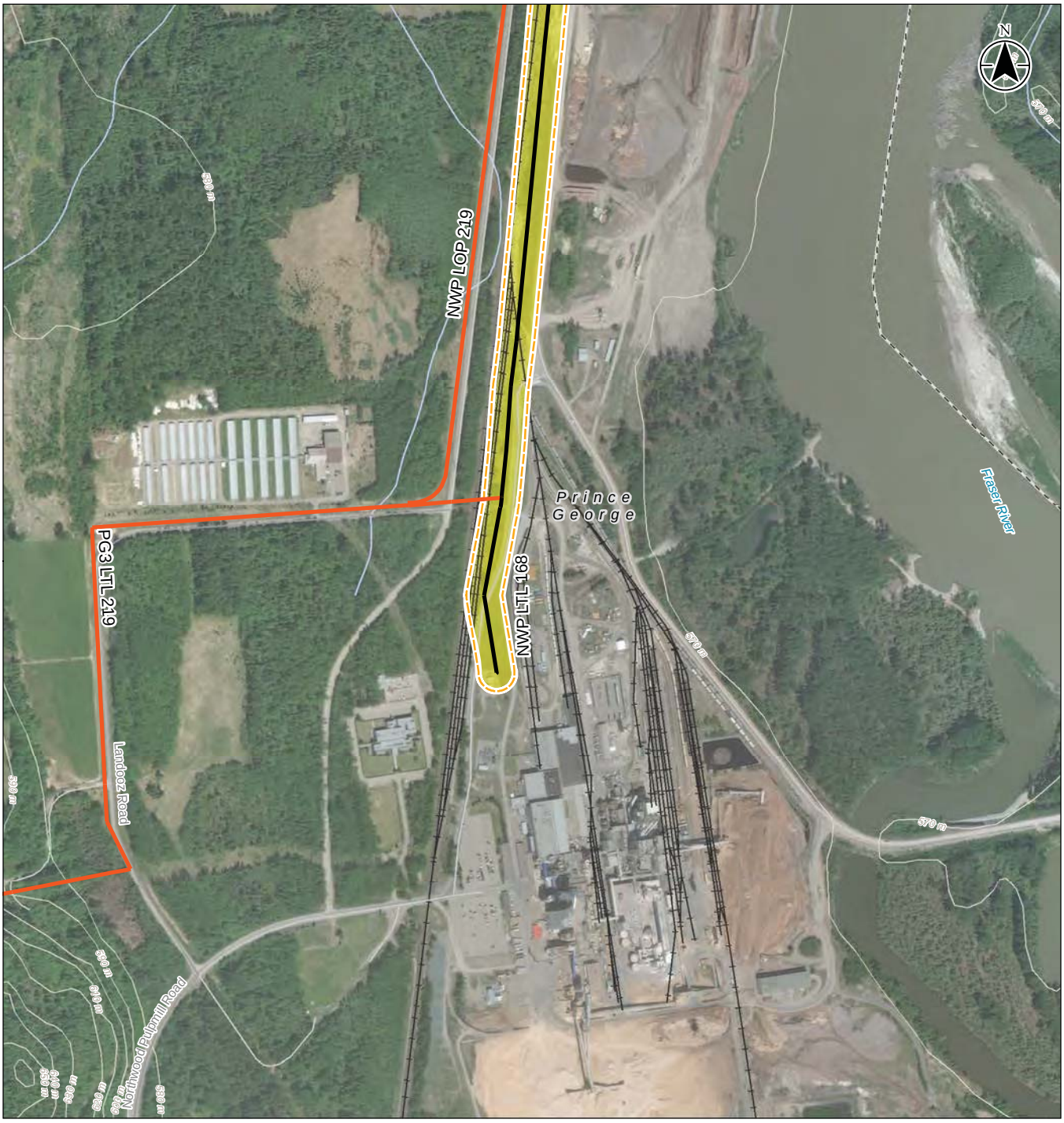

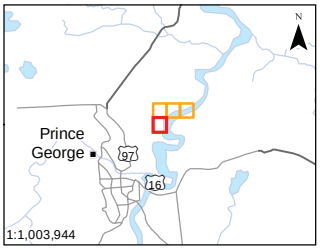

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.5-4

Title
NWP LTL 168

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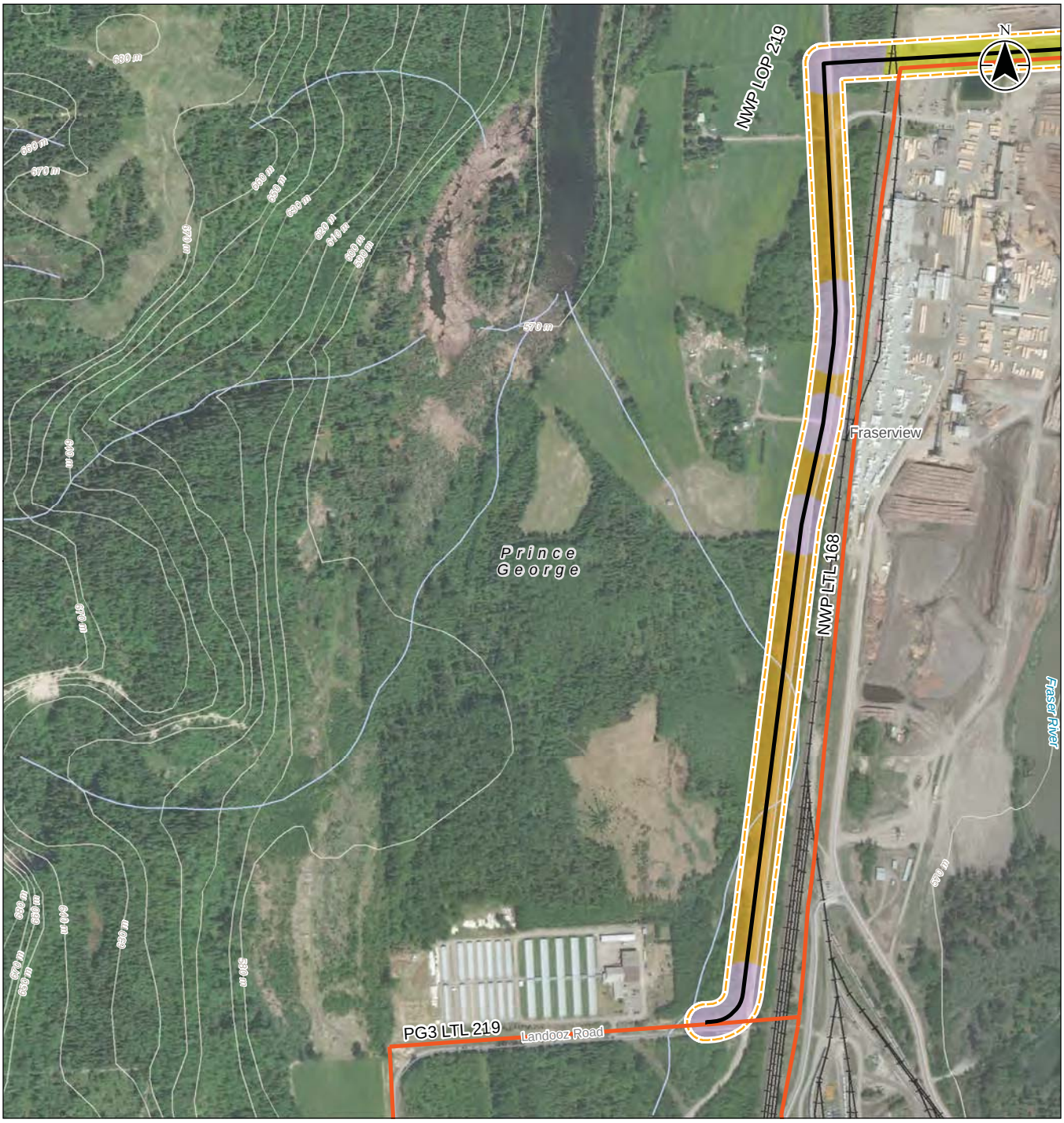

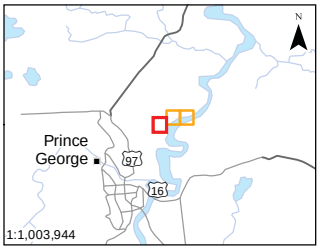

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.6-1

Title
NWP LOP 219

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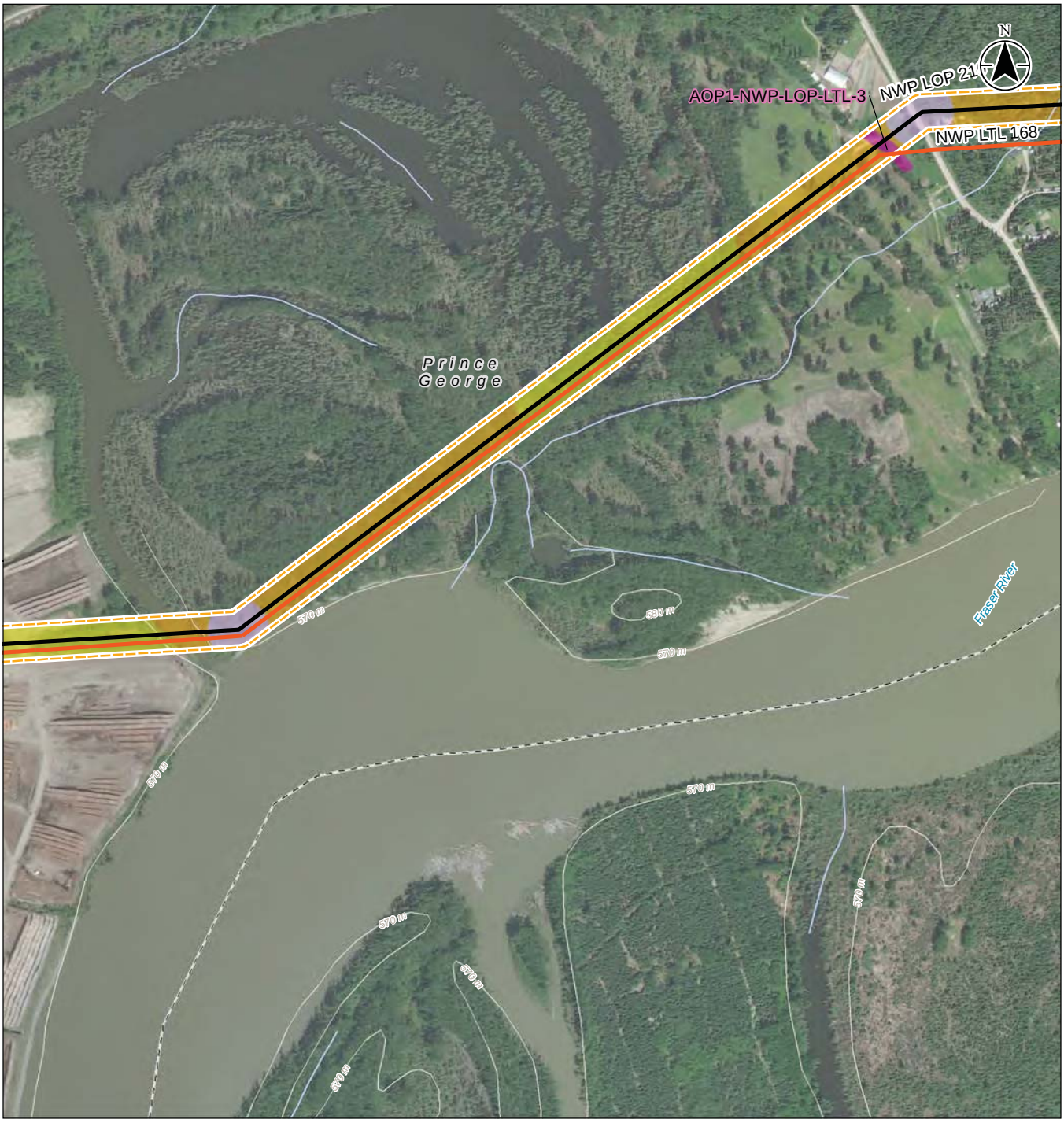

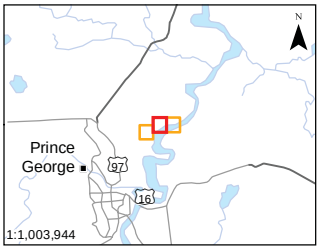

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
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Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.6-2

Title
NWP LOP 219

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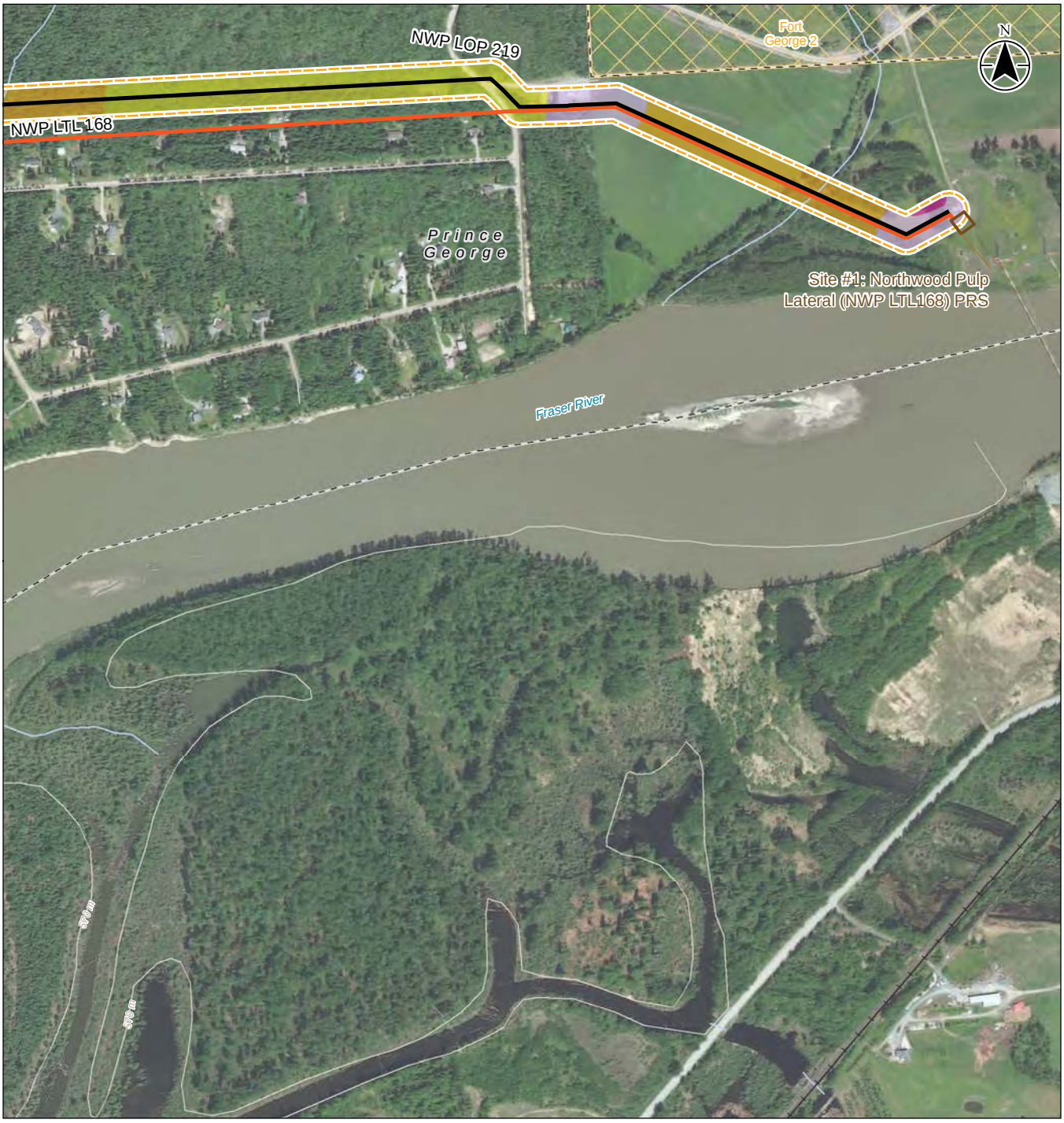

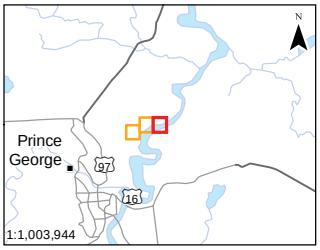

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Local Street
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary
- First Nations Reserve

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Facility

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only
- High Potential - PFR confirmed
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.6-3

Title
NWP LOP 219

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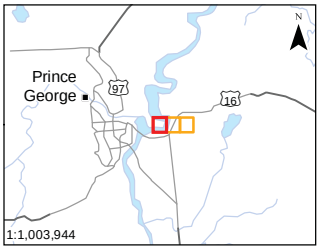

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone

Stopper Zone
Tee Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.7-1

Title
PG1 LTL 168

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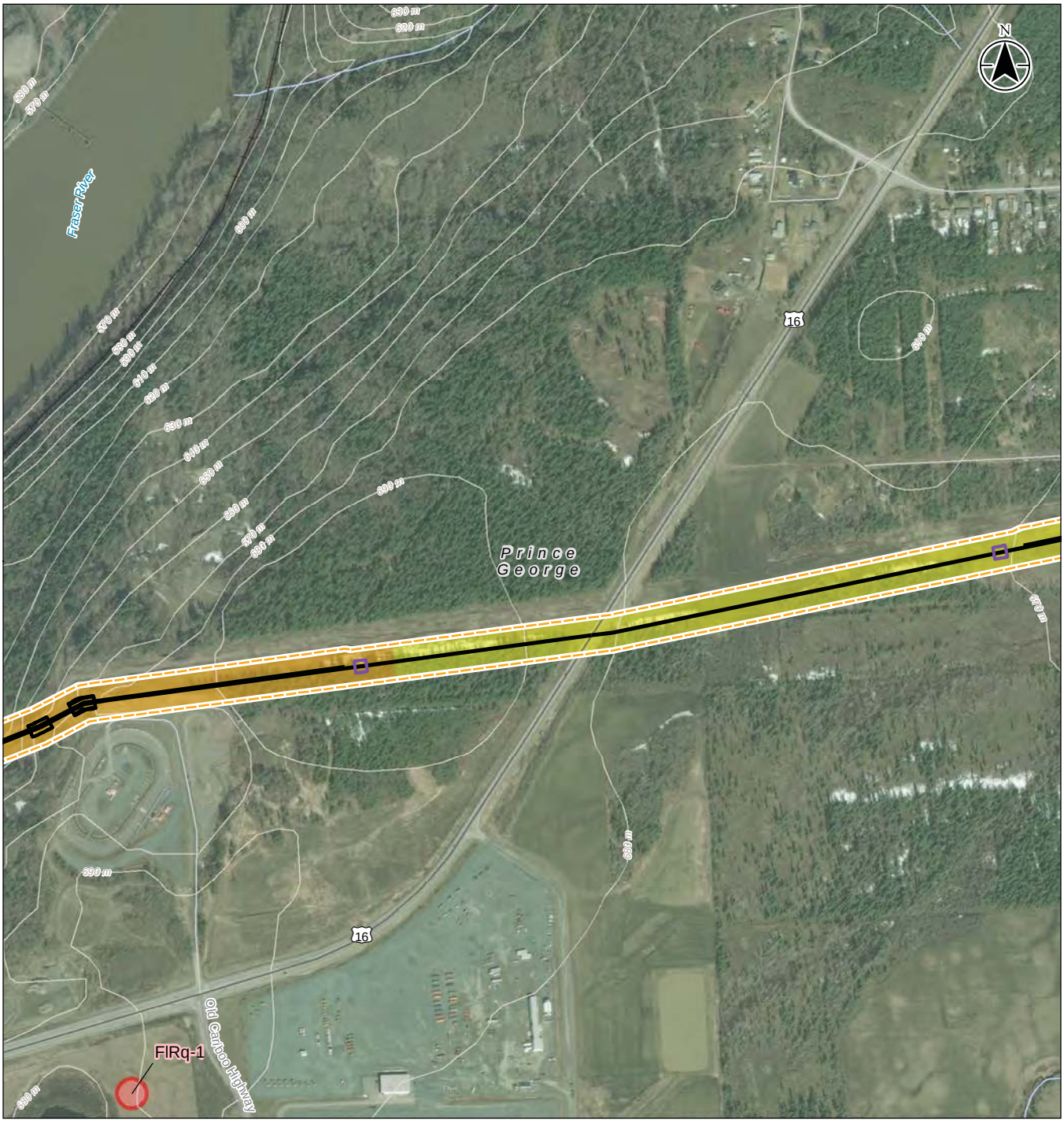

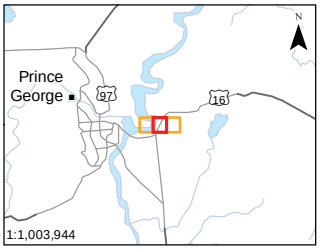

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
Archaeological Site - Previously Recorded

Project Areas
Lateral

Study Area
Bend Zone
Stopper Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.7-2

Title
PG1 LTL 168

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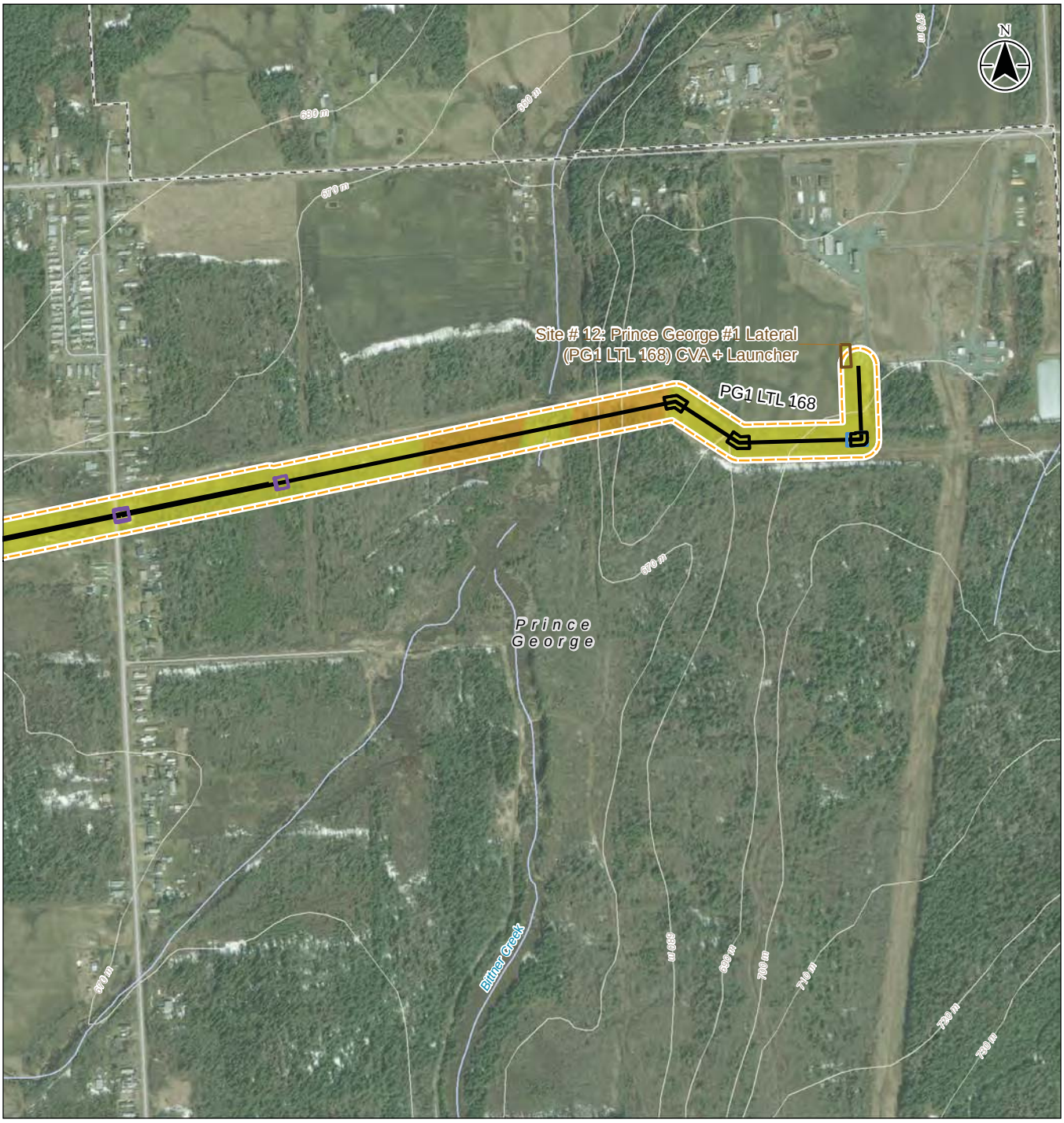

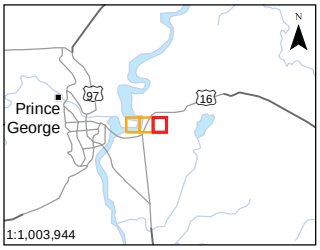

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Facility
Bend Zone
Stopper Zone
Valve Zone

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.7-3

Title
PG1 LTL 168

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Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Local Street
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone
- Stopper Zone
- Tee Zone
- Valve Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.8-1

Title
PGP LTL 168

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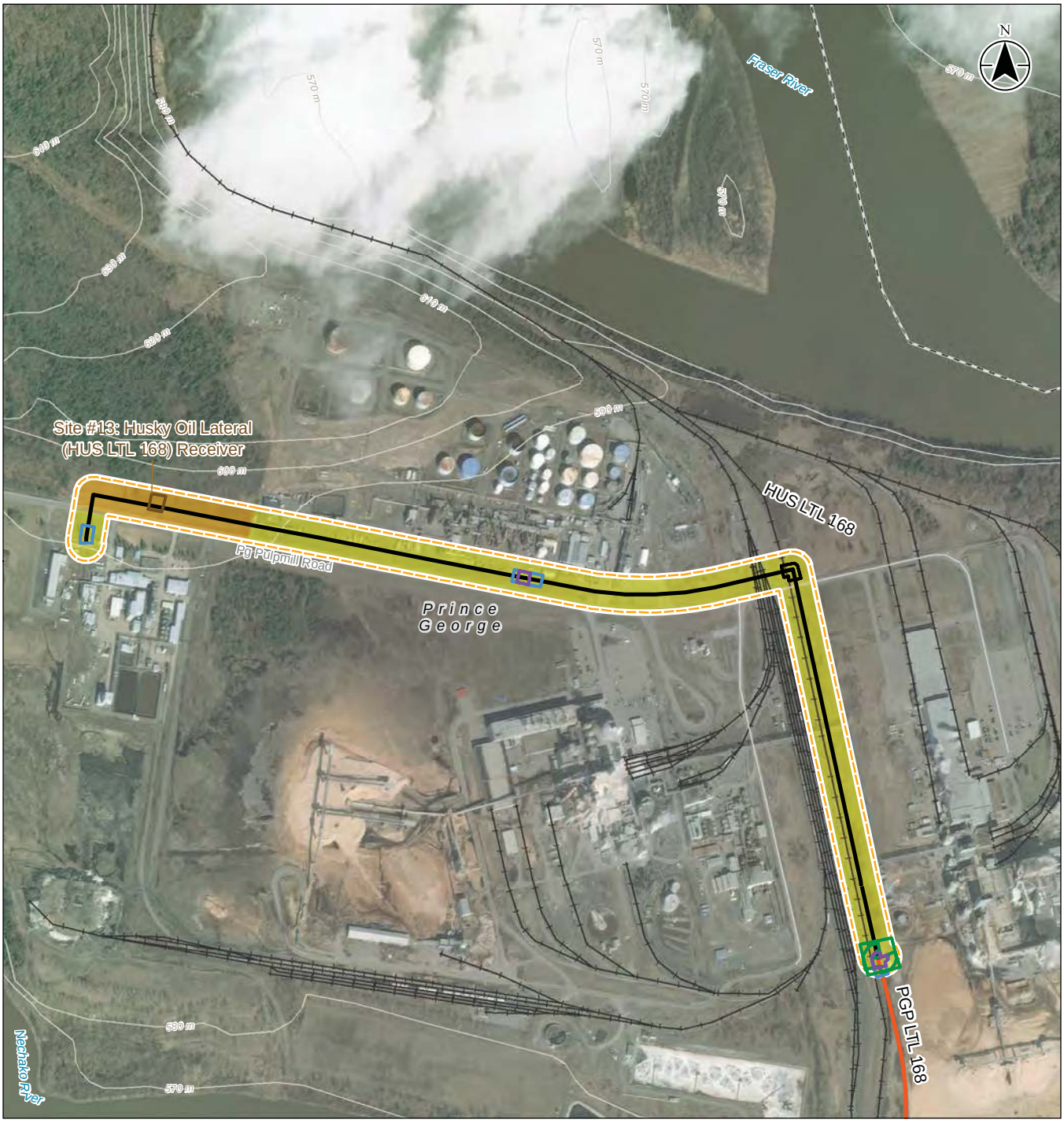

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Road
- Local Street
- Railway
- Topographic Contour
- Municipal Boundary

Project Areas

- Lateral
- Other Fortis Lateral
- Study Area
- Facility
- Bend Zone
- Stopper Zone
- Tee Zone
- Valve Zone

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.9-1

Title
HUS LTL 168

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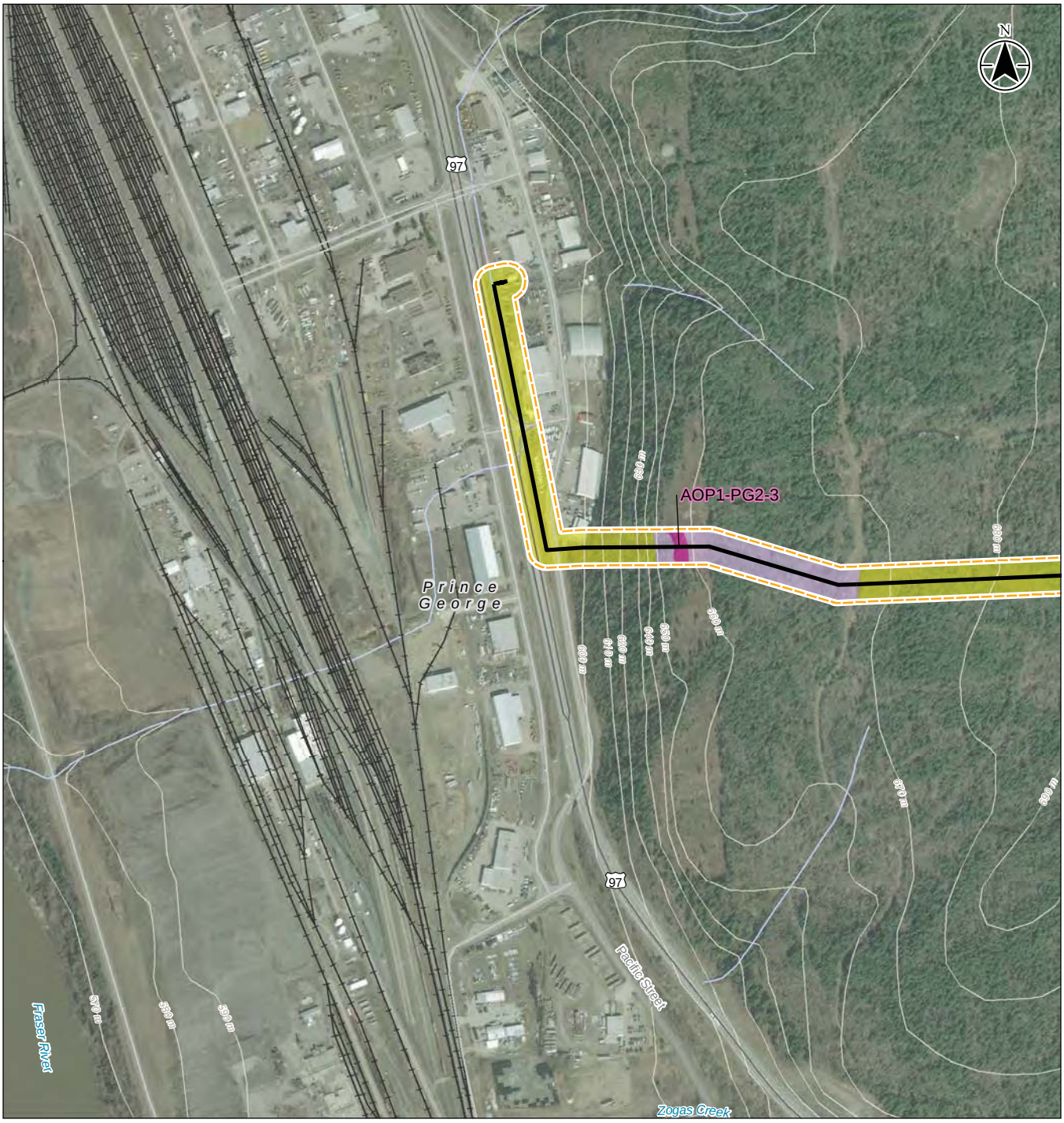

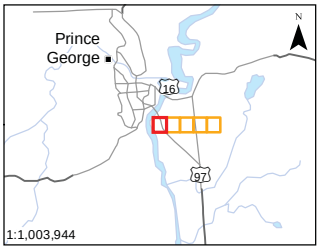

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

AOA Results
Low Potential - Desktop review only
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.10-1

Title
PG2 219 168

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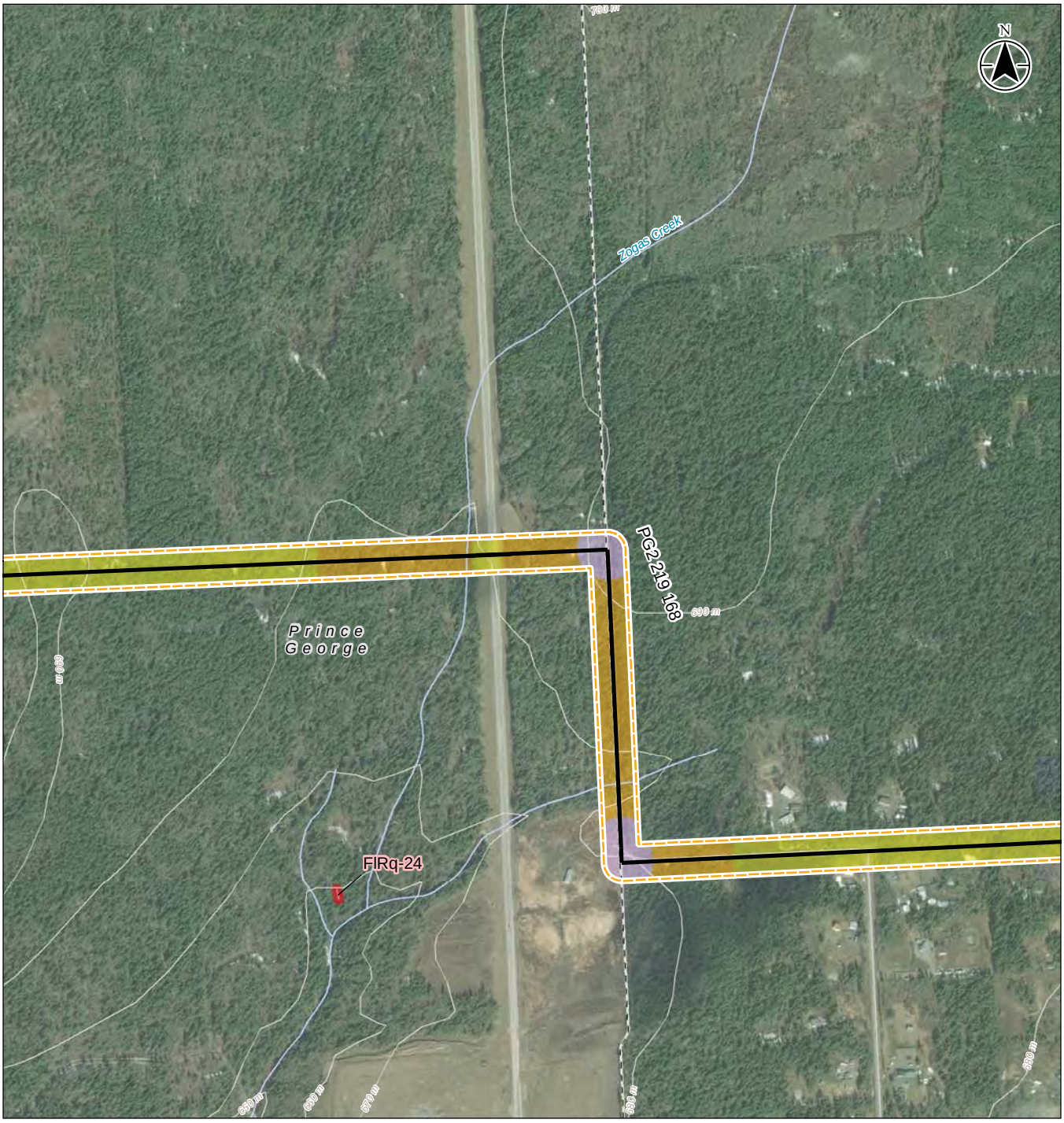

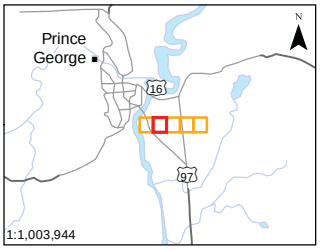

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Local Street
- Topographic Contour
- Watercourse
- Municipal Boundary
- Archaeological Site - Previously Recorded

Project Areas

- Lateral
- Study Area

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.10-2

Title
PG2 219 168

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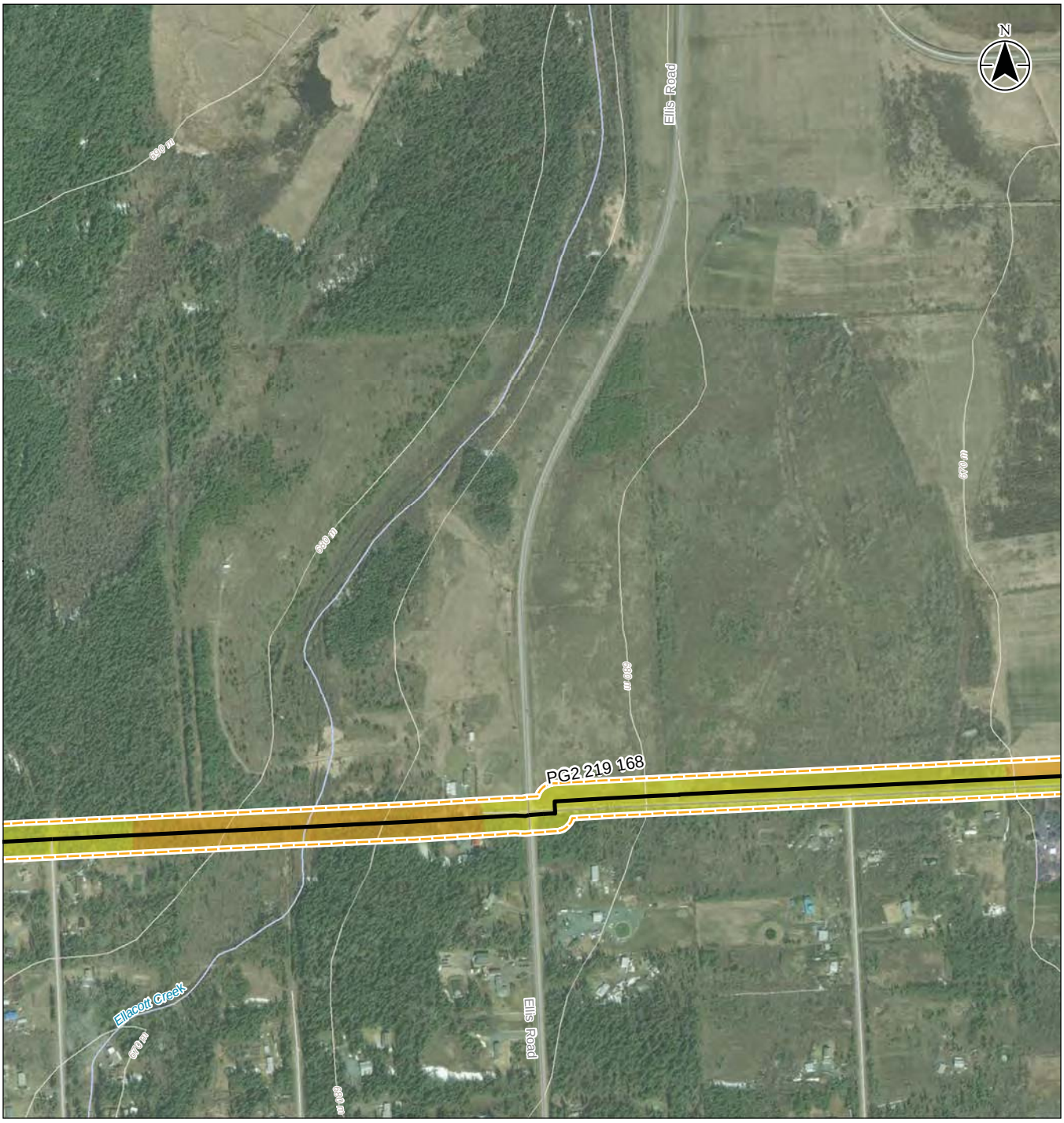

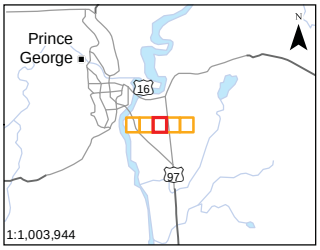

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.10-3

Title
PG2 219 168

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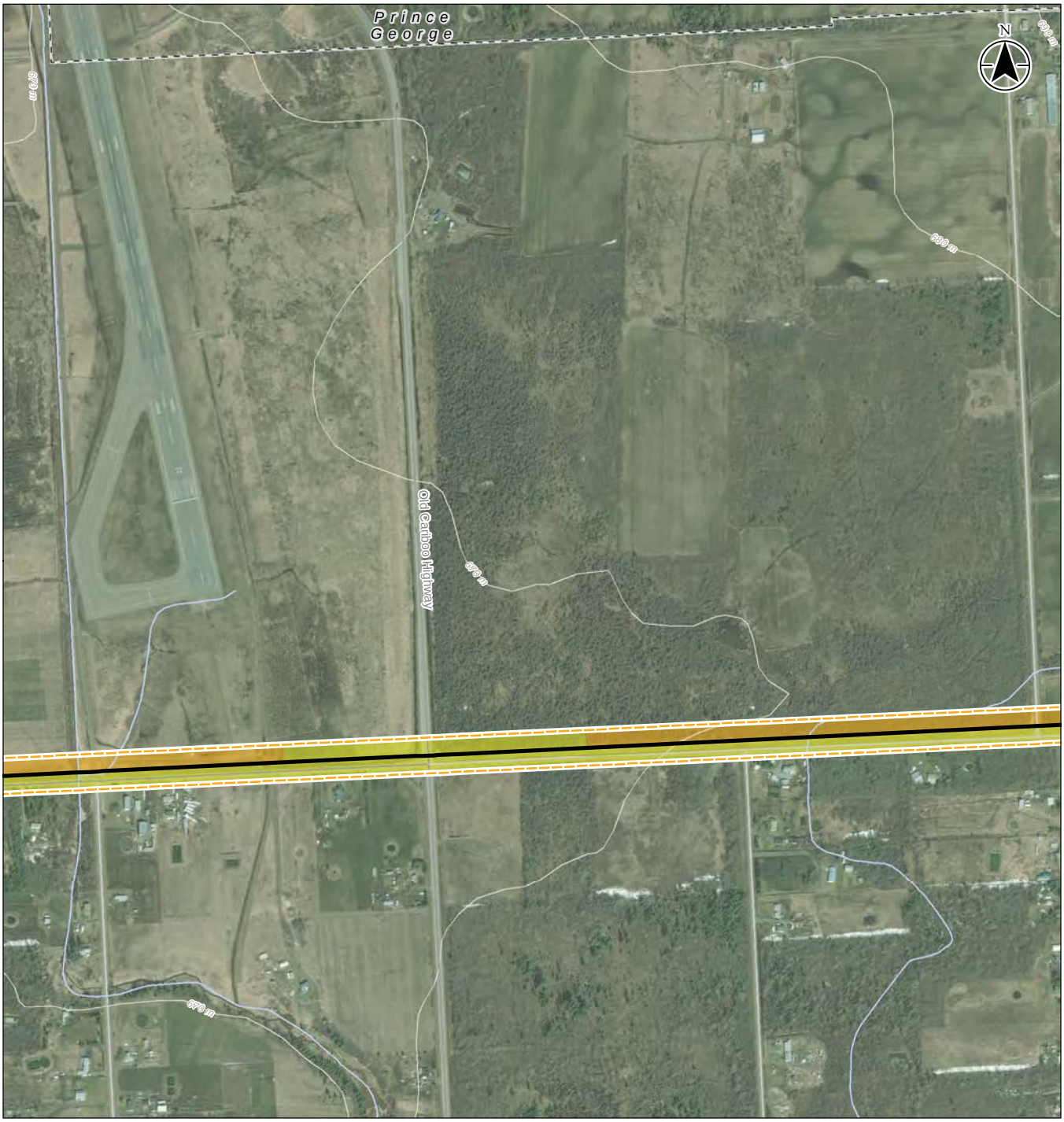

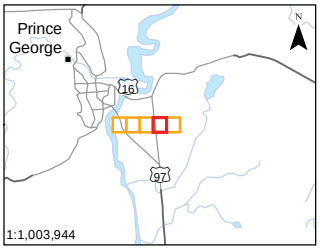

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
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Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.10-4

Title
PG2 219 168

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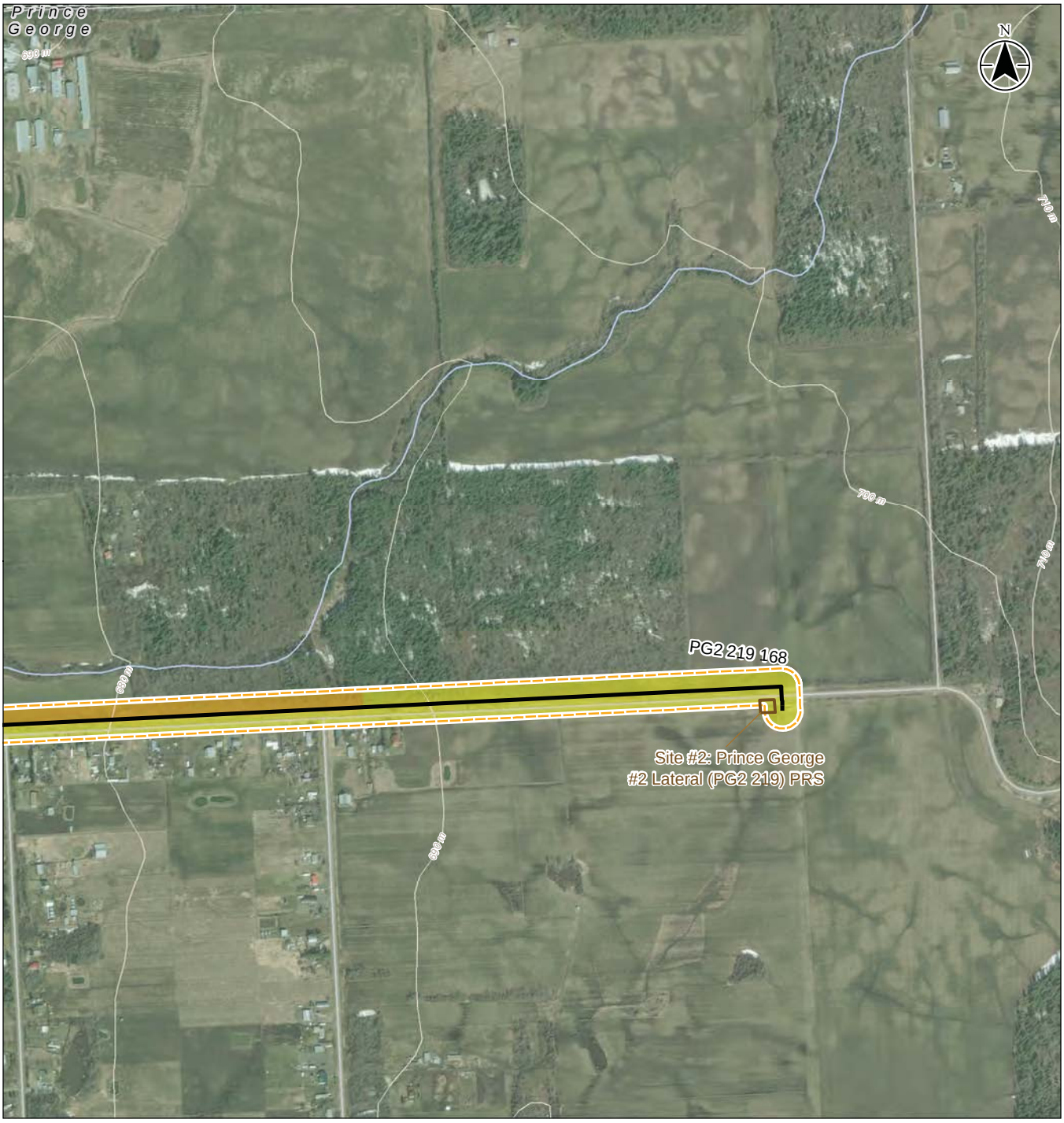

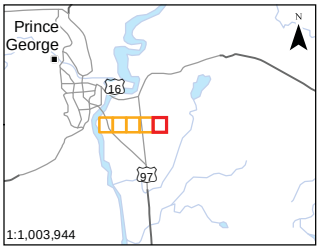

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Facility

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.10-5

Title
PG2 219 168

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Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary
Archaeological Site - Previously Recorded
Heritage Site - Previously Recorded

Project Areas
Lateral
Study Area

Facility

Archaeological Potential Model
Quesnel Forest District AOA - High Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.11-1

Title
CAR LTL 168

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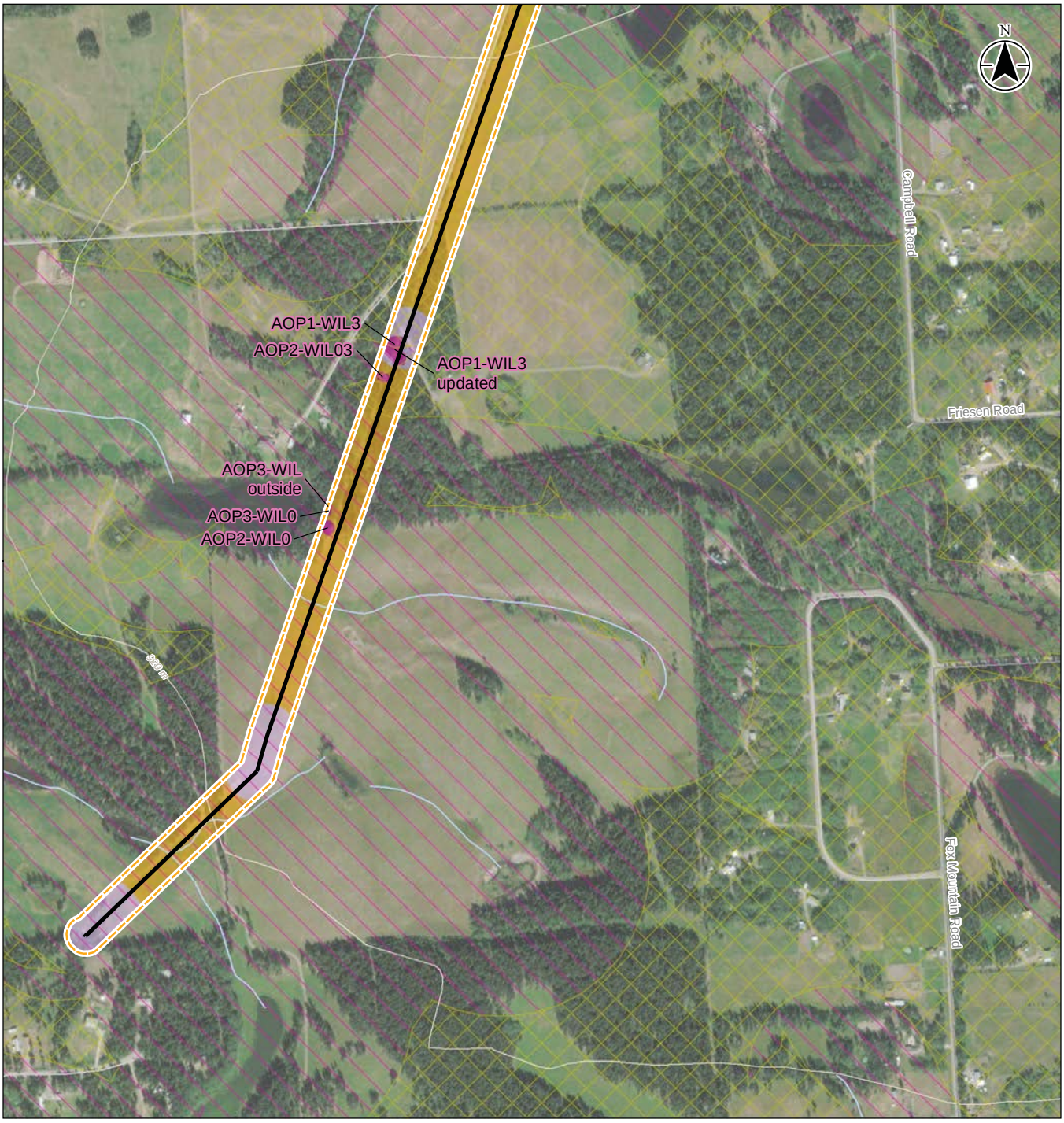

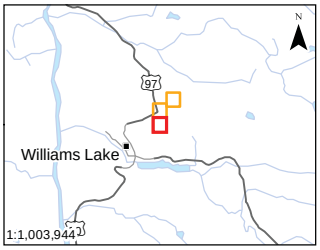

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area

Archaeological Potential Model
Secwemeq AOA - High Archaeological Potential
Secwemeq AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.12-1

Title
WIL LP1 168

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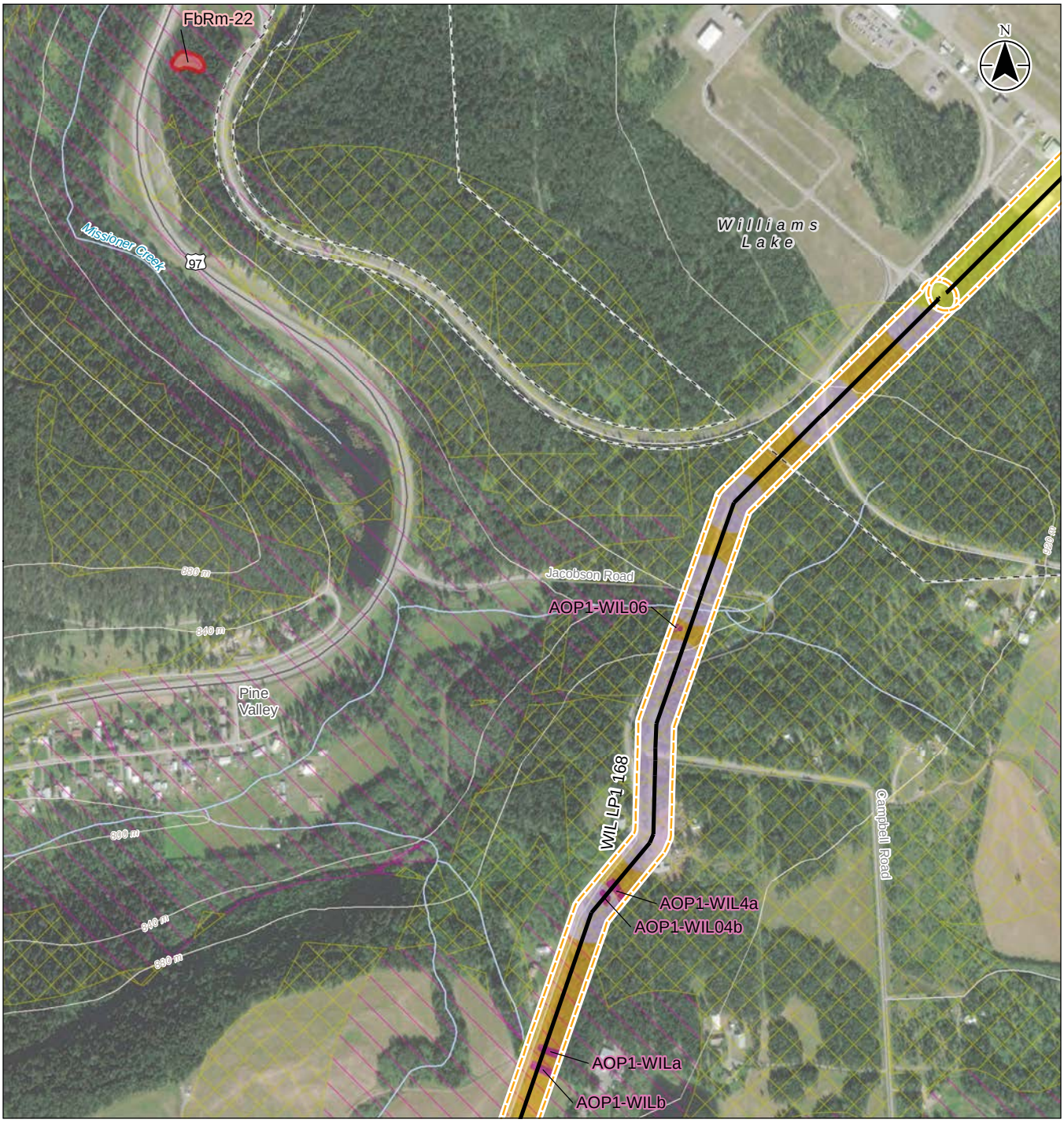

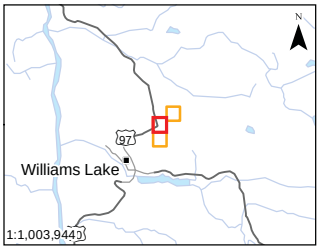

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary
Archaeological Site - Previously Recorded

Project Areas
Lateral
Study Area

Archaeological Potential Model
Secwemeq AOA - High Archaeological Potential
Secwemeq AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.12-2

Title
WIL LP1 168

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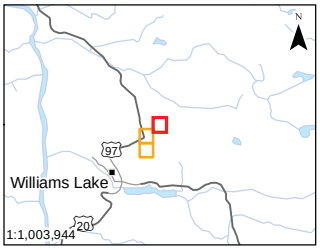

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Forest Tenure Road
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Facility

Archaeological Potential Model
Secwemeq AOA - High Archaeological Potential
Secwemeq AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
A.12-3

Title
WIL LP2 168

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APPENDIX B

Set 2 Lateral Results Figures

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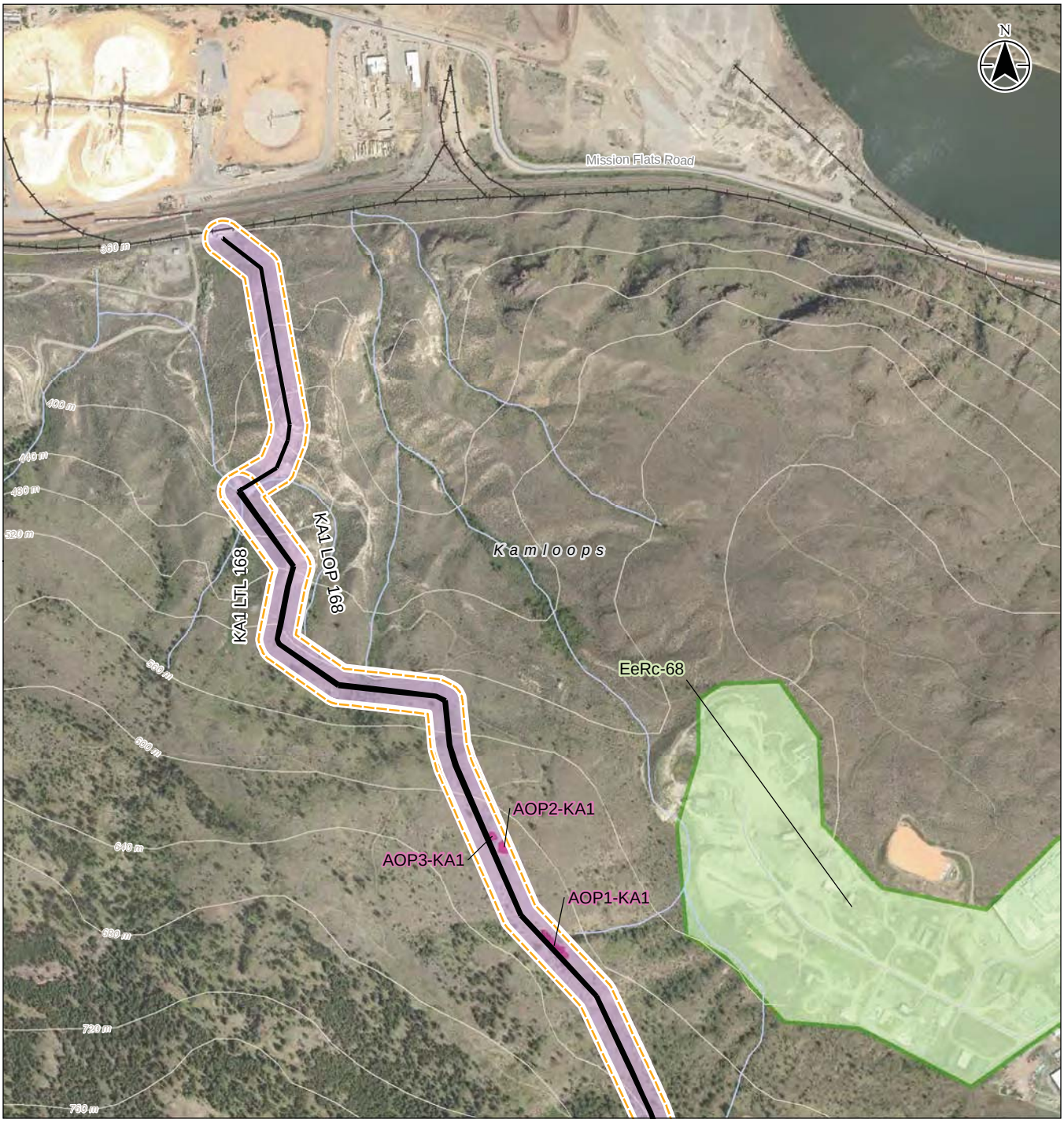

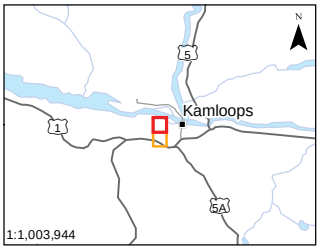

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
Heritage Site - Previously Recorded

Project Areas
Lateral
Study Area

AOA Results
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.1-1

Title
KA1 LOP 168

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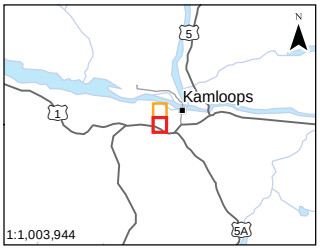

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

AOA Results
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.1-2

Title
KA1 LOP 168

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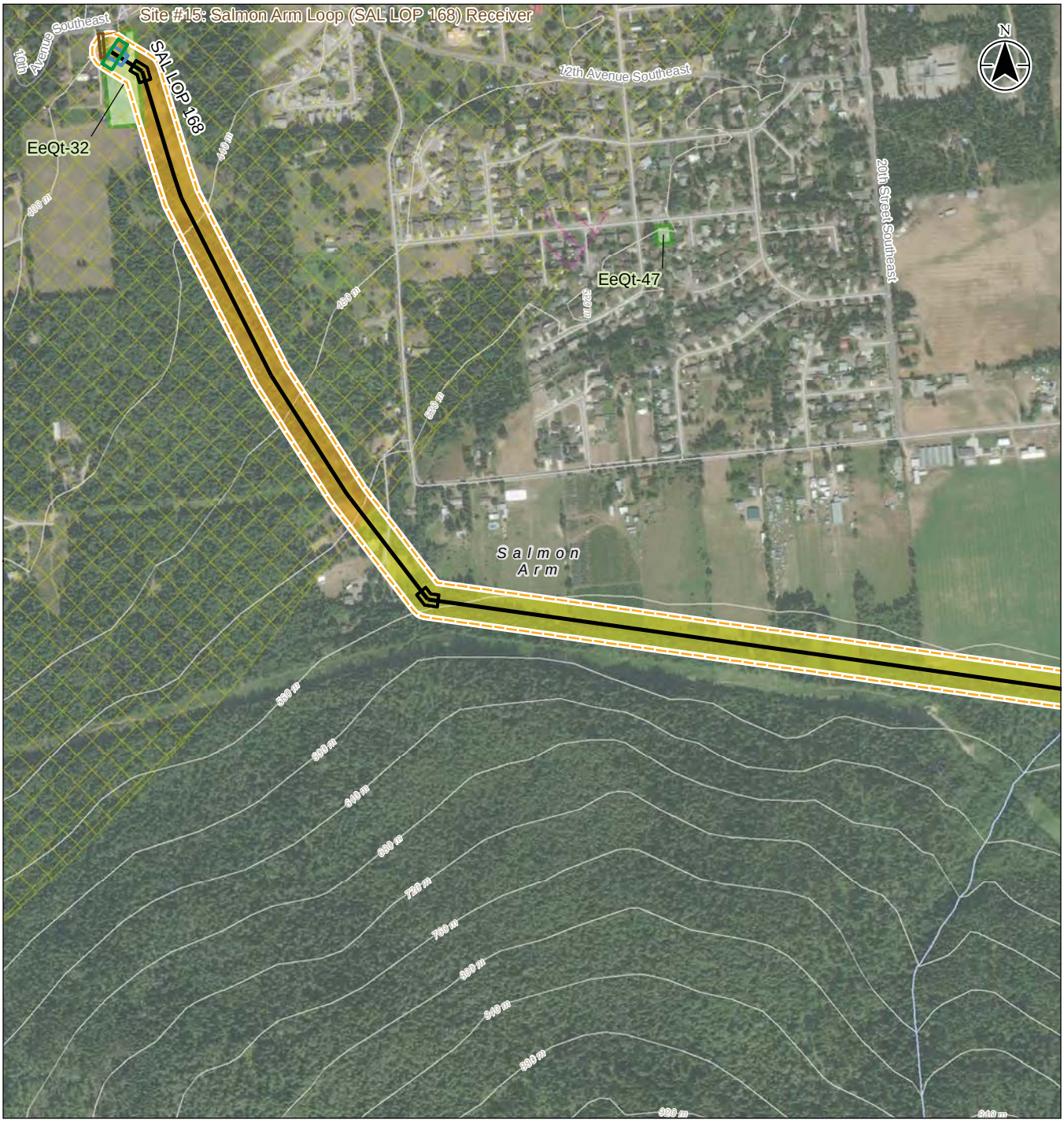

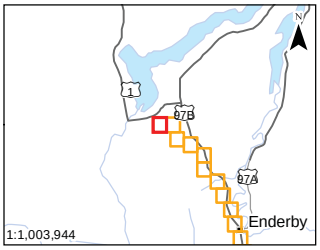

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Road
- Local Street
- Topographic Contour
- Watercourse
- Municipal Boundary
- Heritage Site - Previously Recorded

Project Areas

- Lateral
- Study Area
- Facility
- Bend Zone
- Tee Zone
- Valve Zone

Archaeological Potential Model

- Okanagan AOA - High Archaeological Potential
- Okanagan AOA - Moderate Archaeological Potential

AOA Results

- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-1

Title
SAL LOP 168

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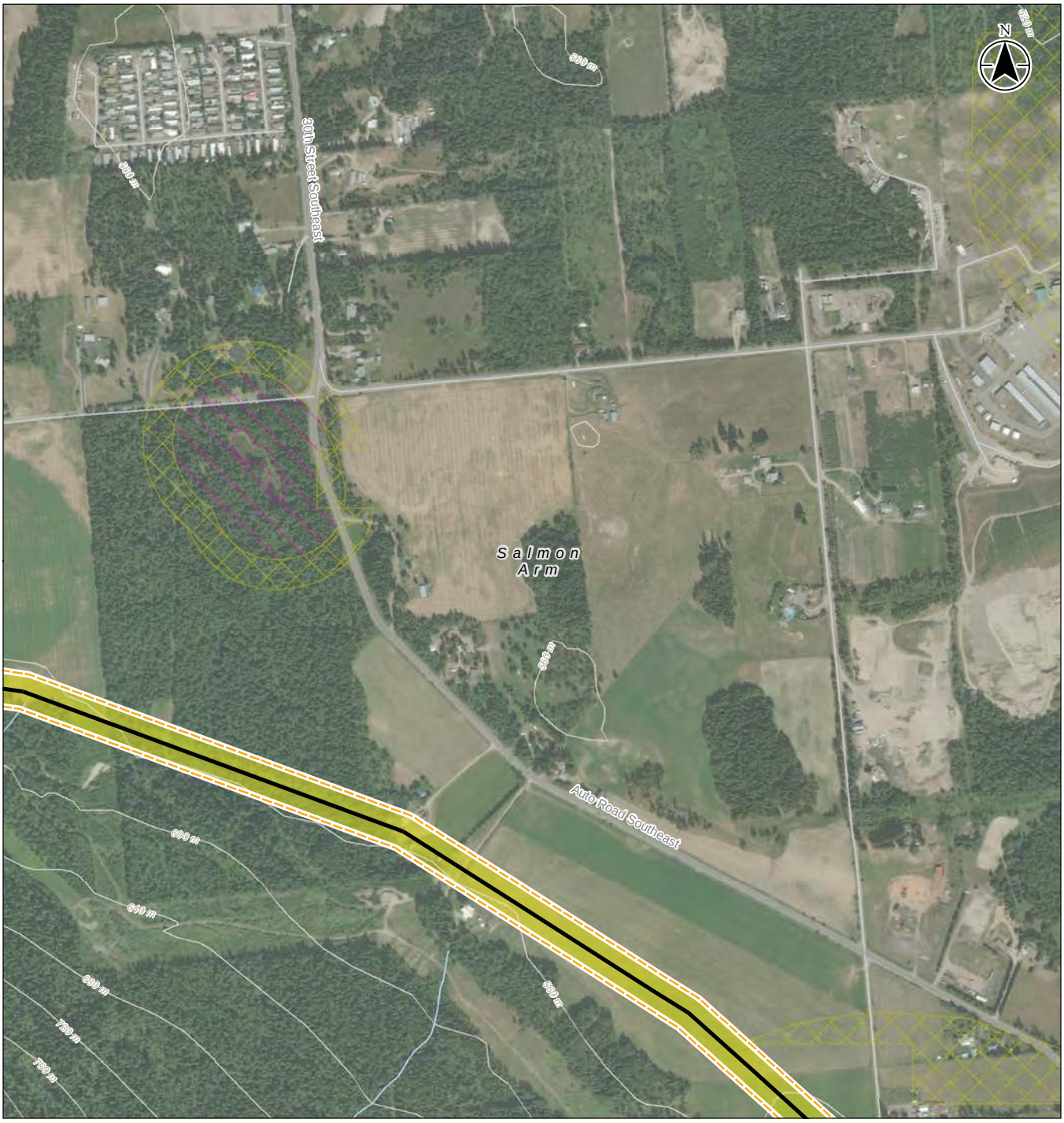

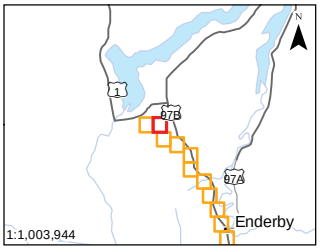

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas

Lateral
Study Area

Archaeological Potential Model

Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results

Low Potential - Desktop review only

0 100 200 300 400 m
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Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-2

Title
SAL LOP 168

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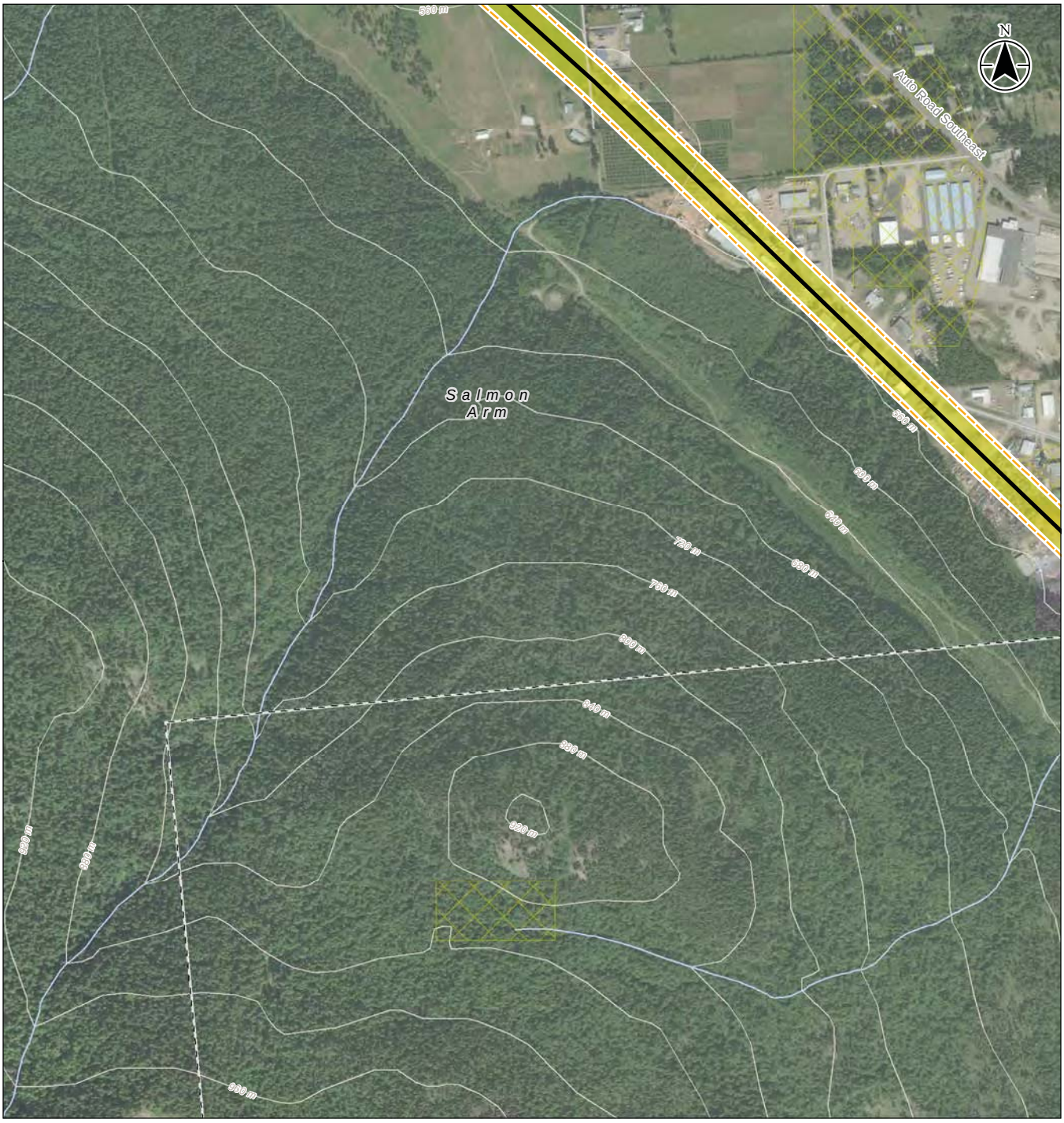

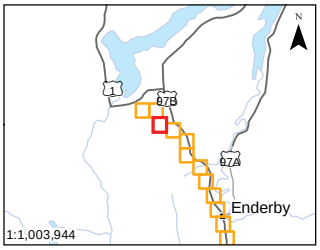

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - Moderate Archaeological Potential

AOA Results
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-3

Title
SAL LOP 168

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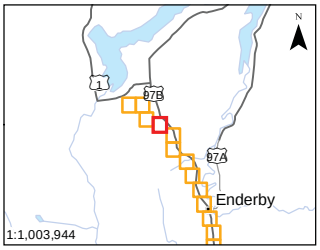

Notes
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2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Other Fortis Lateral
Study Area
Bend Zone
Stopper Zone
Tee Zone
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
High Potential - PFR confirmed
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-4

Title
SAL LOP 168

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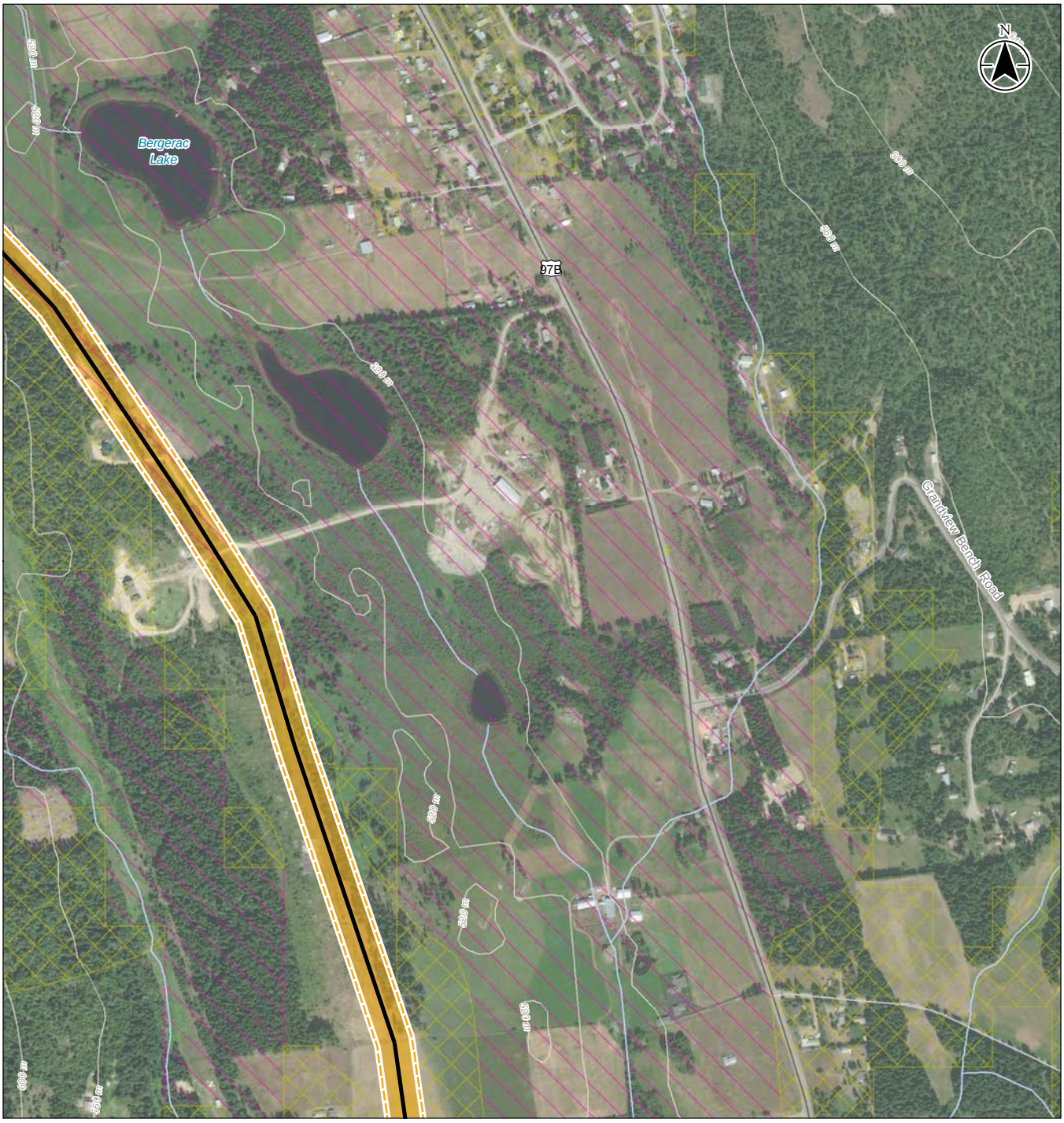

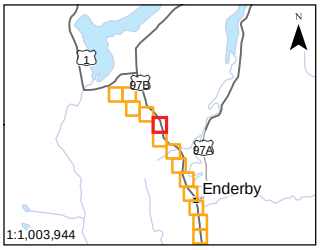

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-5

Title
SAL LOP 168

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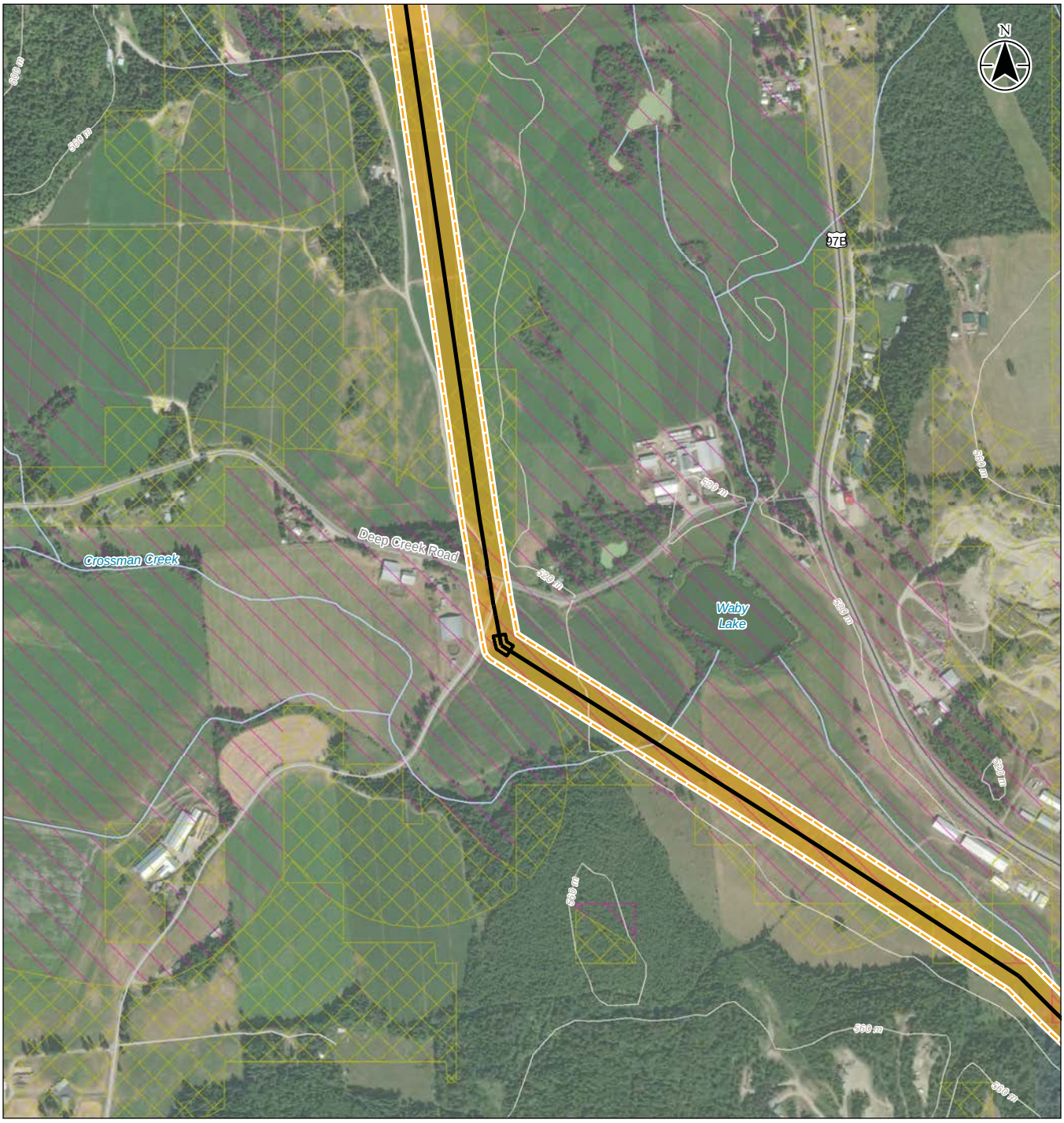

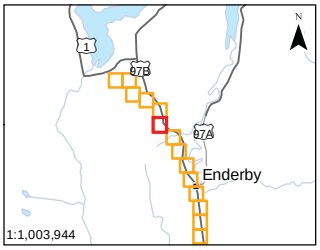

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-6

Title
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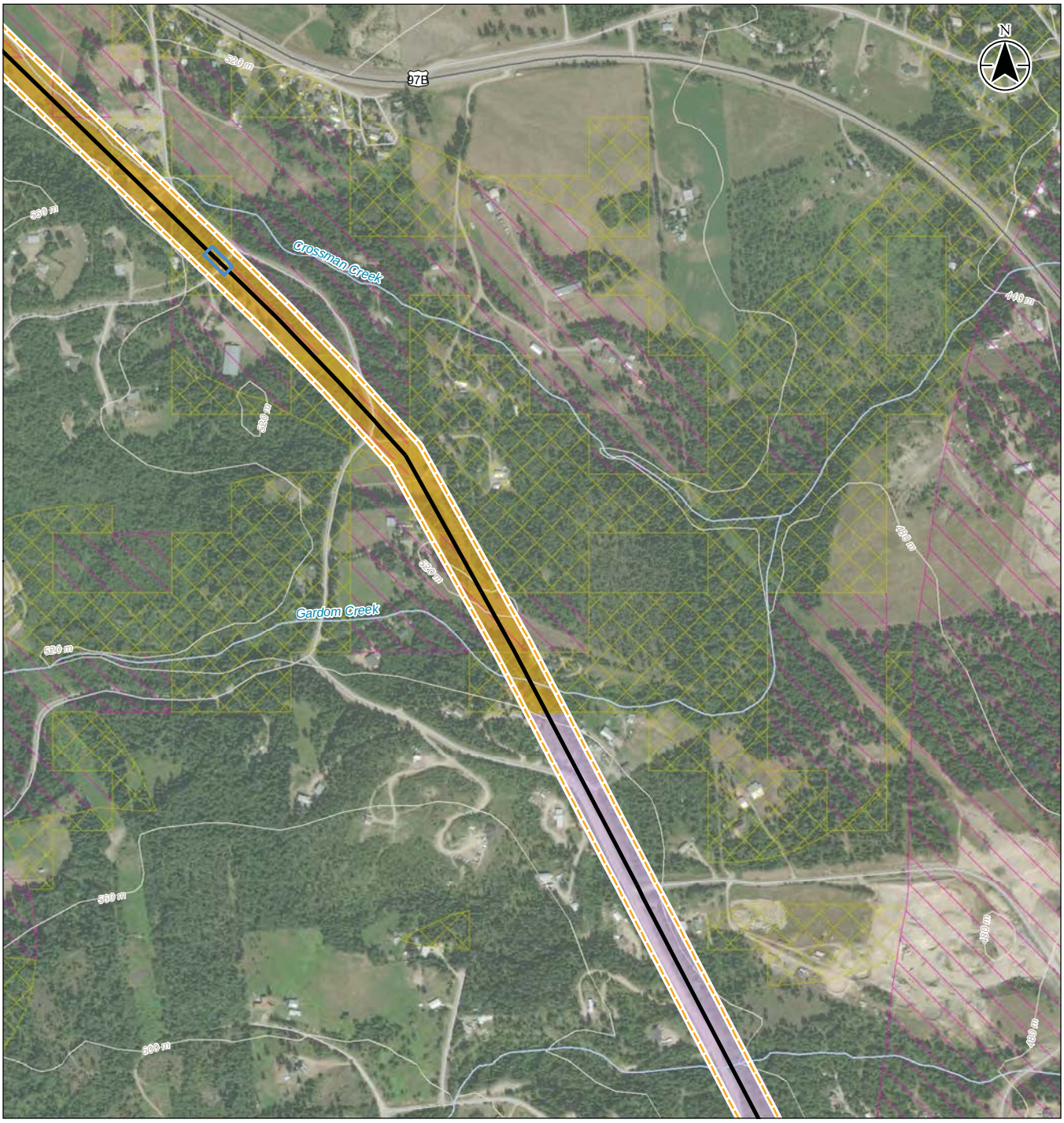

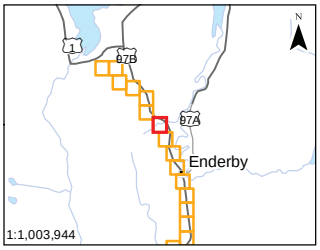

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-7

Title
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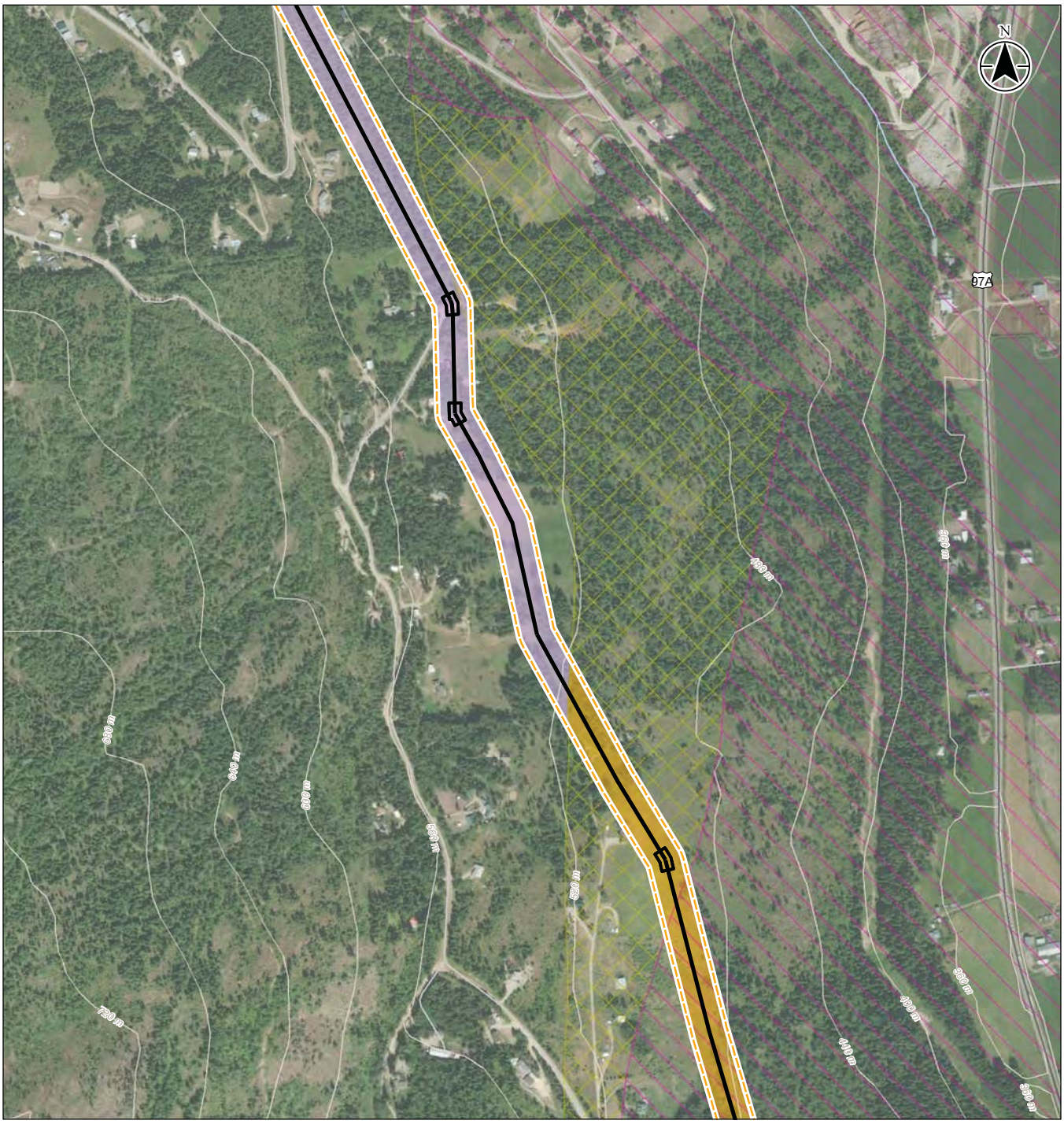

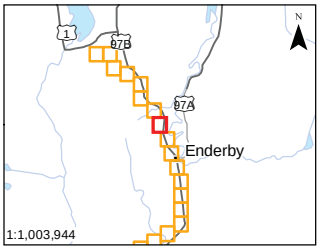

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Topographic Contour
Watercourse

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-8

Title
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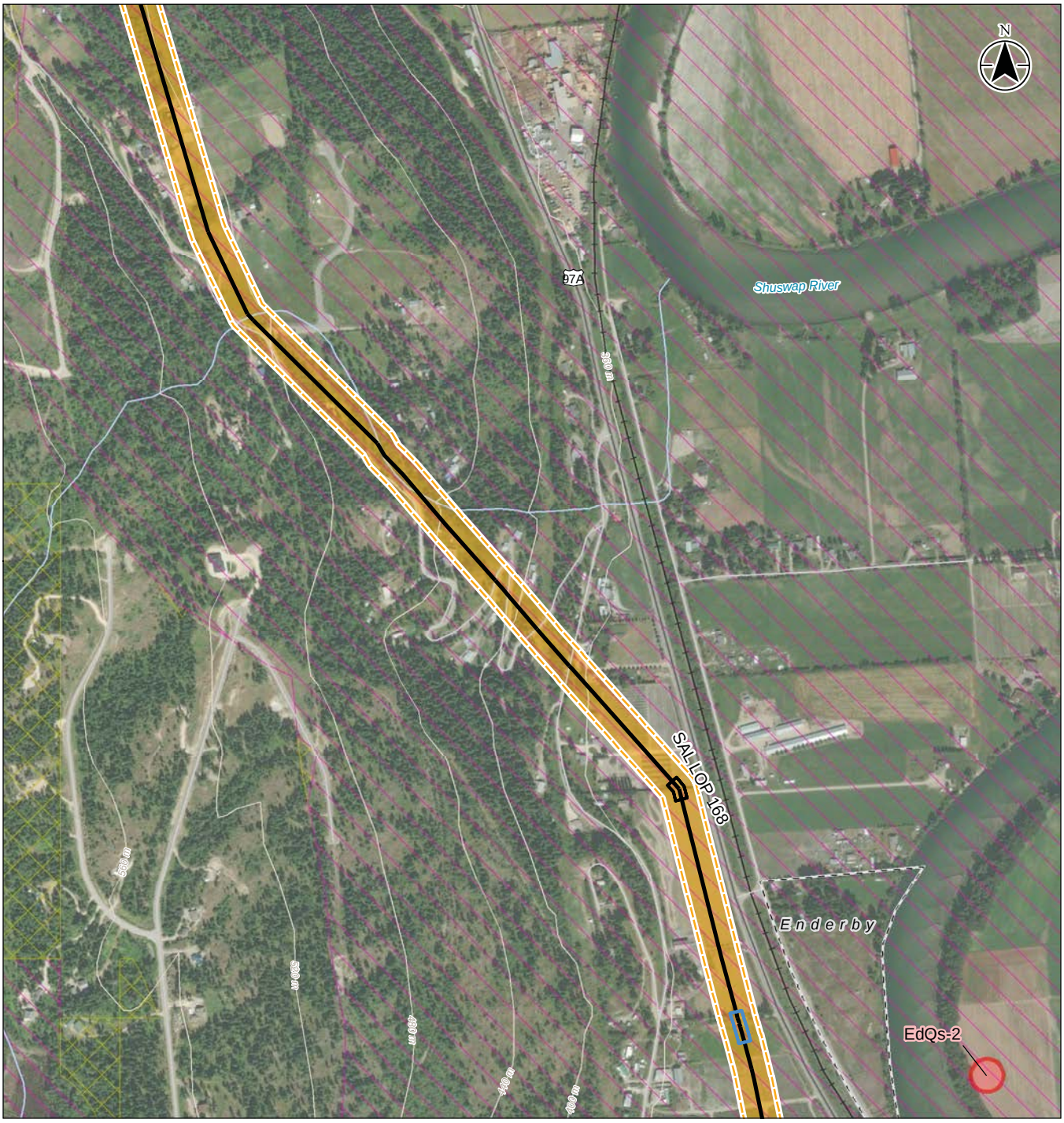

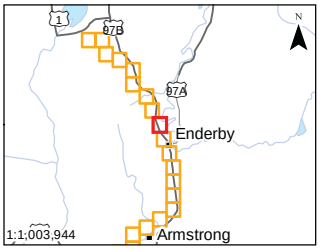

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
Archaeological Site - Previously Recorded

Project Areas
Lateral
Study Area
Bend Zone
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-9

Title
SAL LOP 168

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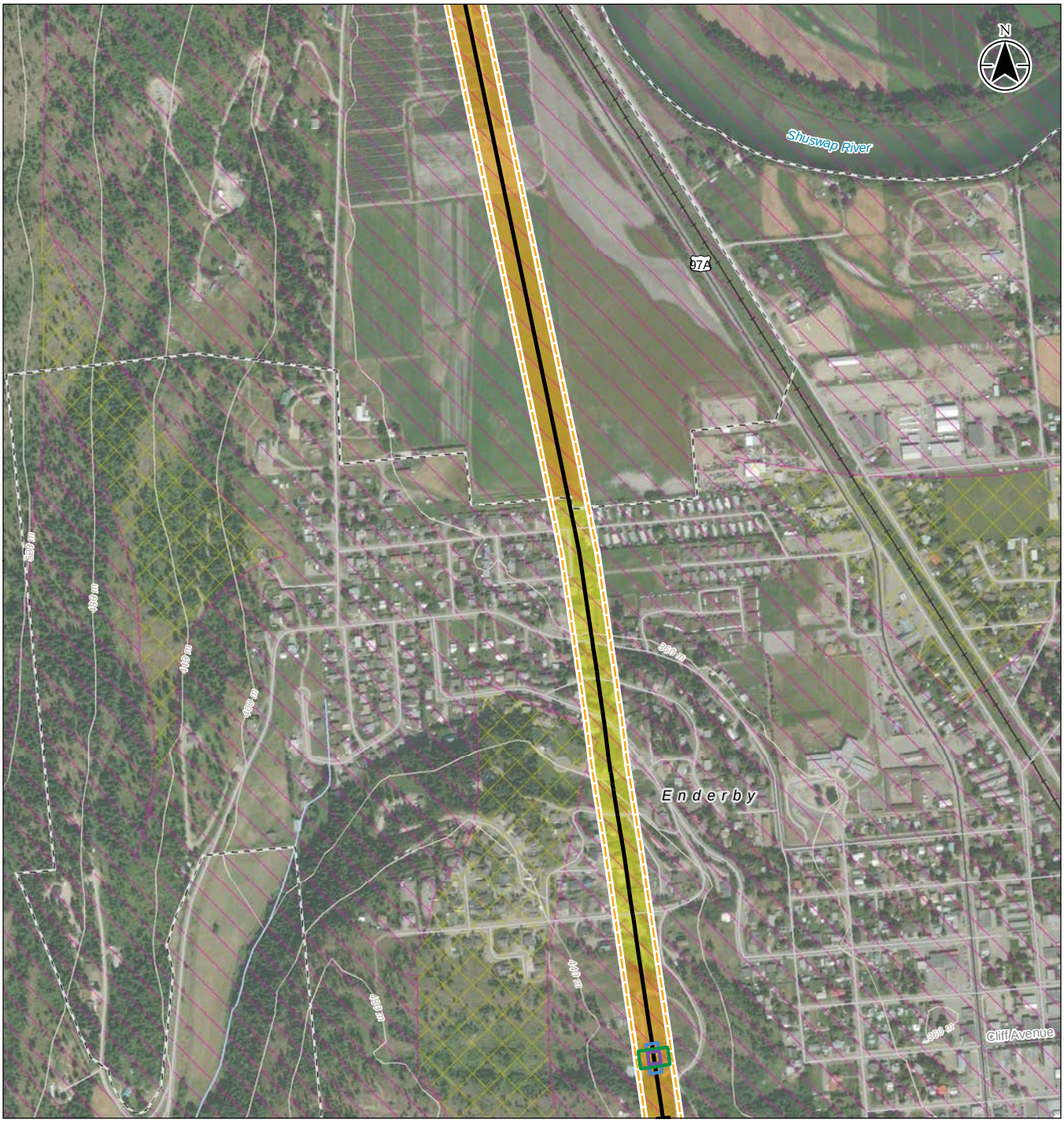

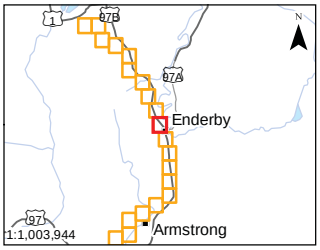

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone
Stopper Zone
Tee Zone
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-10

Title
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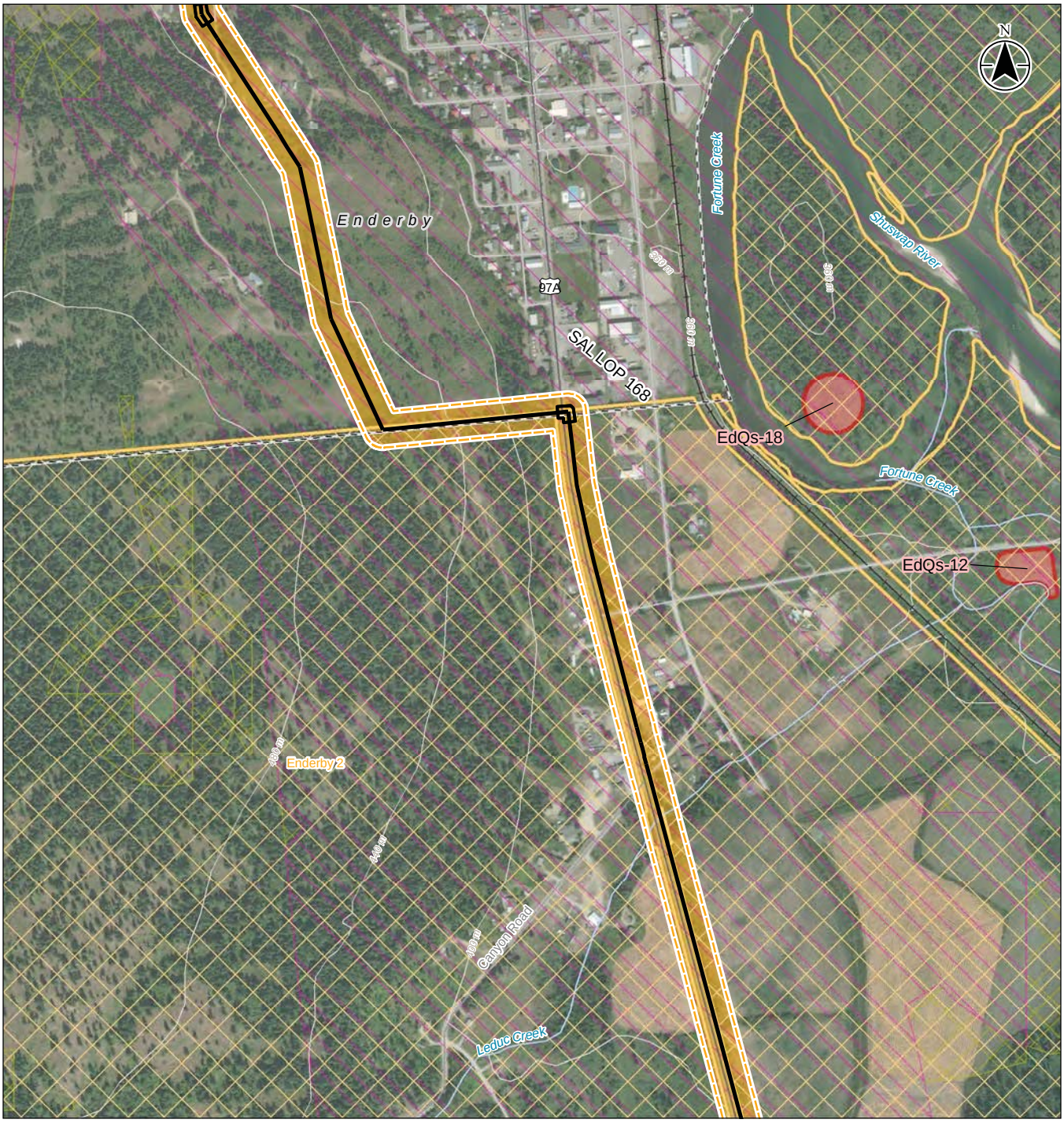

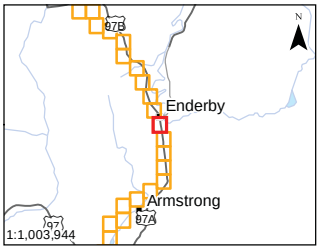

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve
Archaeological Site - Previously Recorded

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-11

Title
SAL LOP 168

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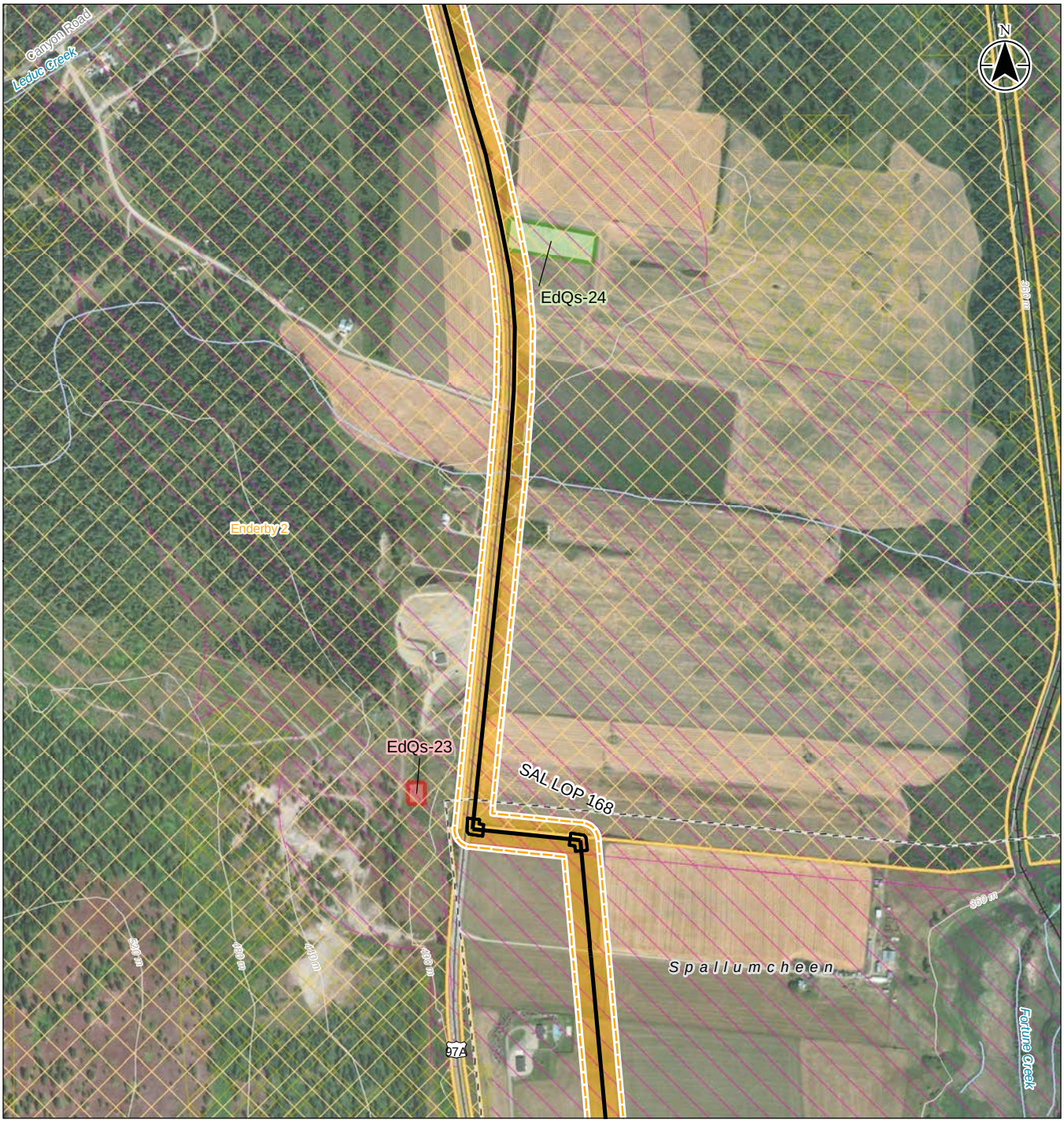

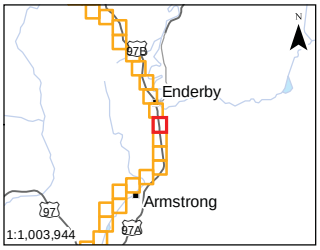

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve
Archaeological Site - Previously Recorded
Heritage Site - Previously Recorded

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
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Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-12

Title
SAL LOP 168

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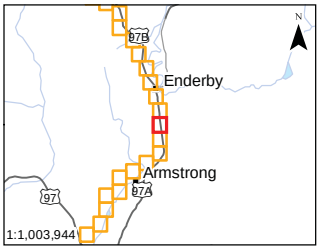

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-13

Title
SAL LOP 168

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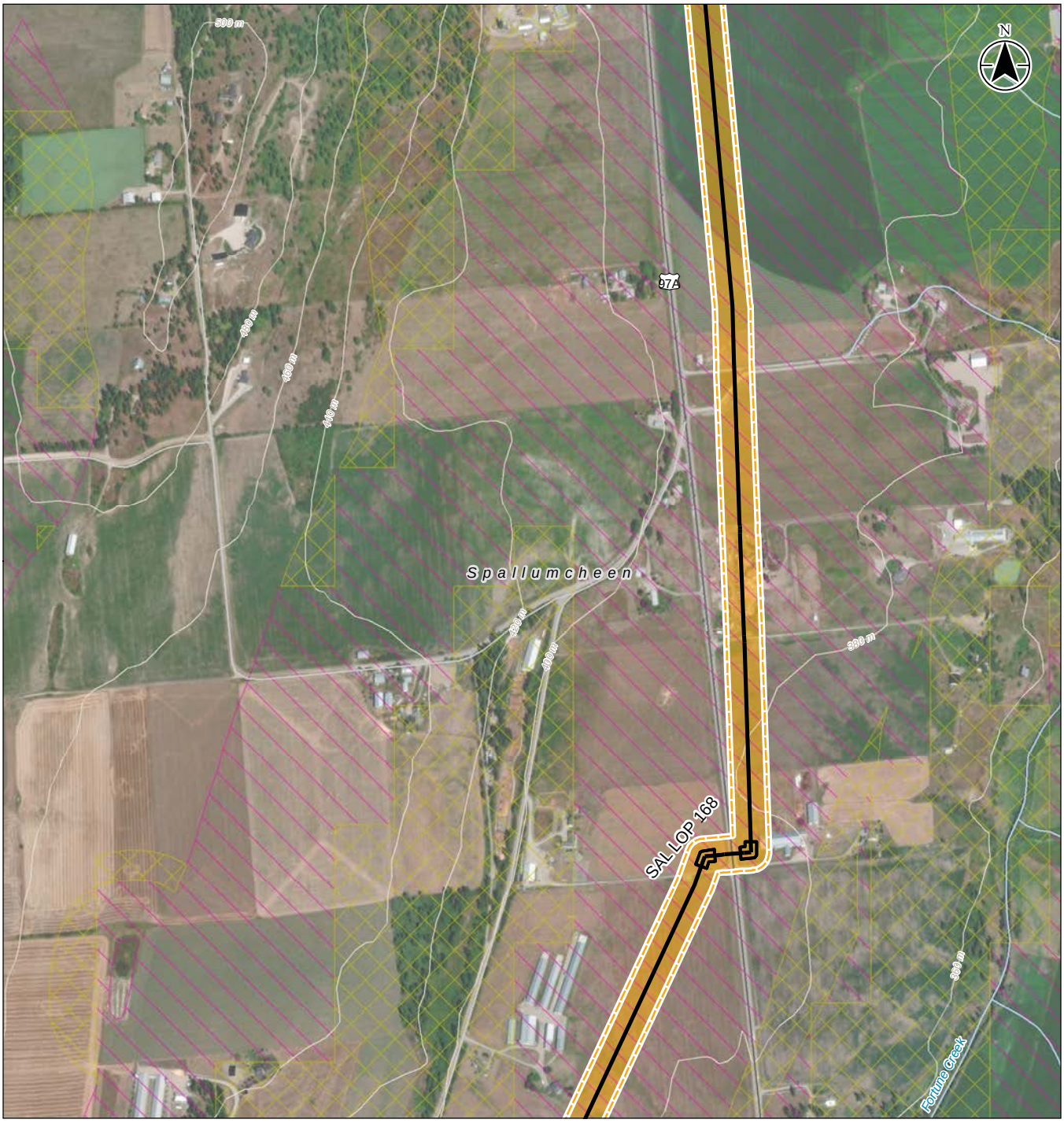

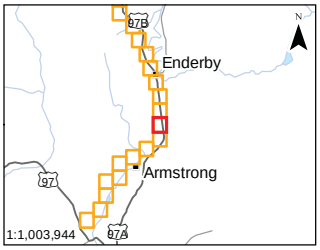

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-14

Title
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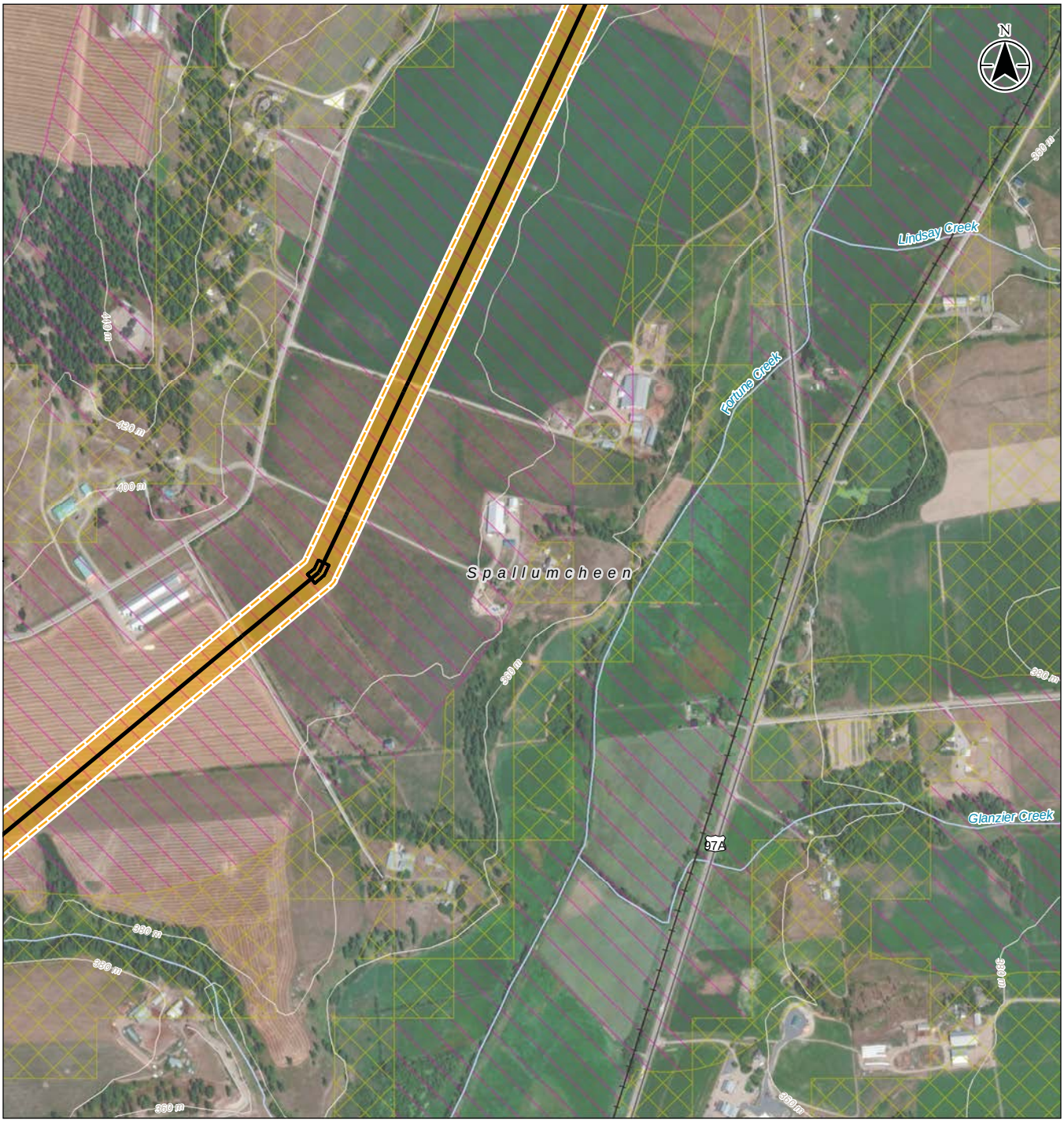

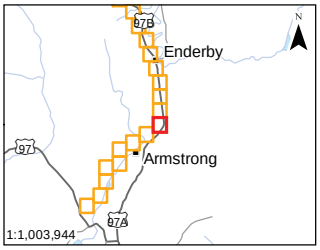

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-15

Title
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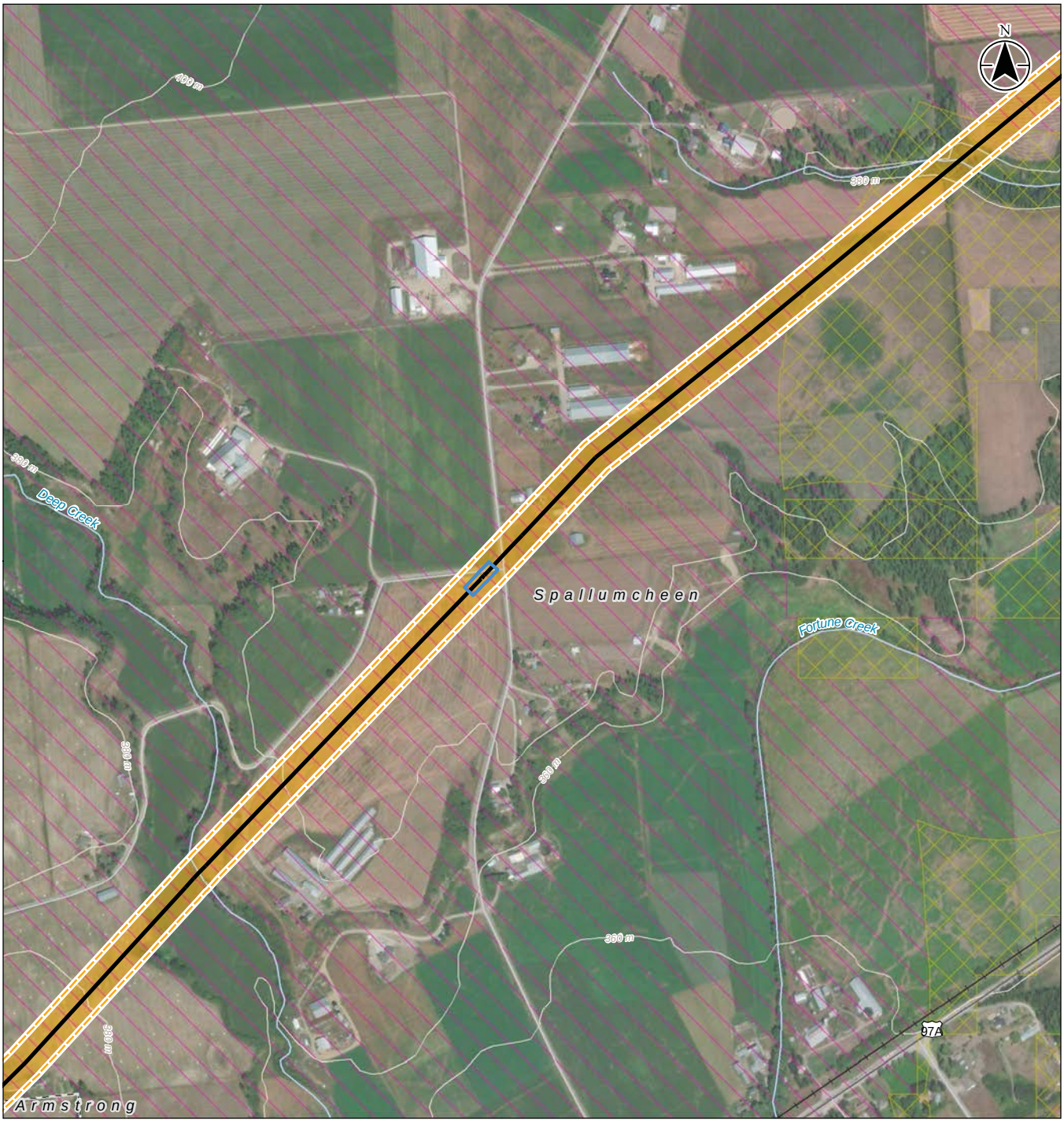

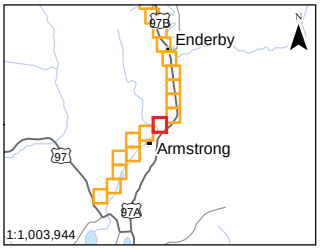

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-16

Title
SAL LOP 168

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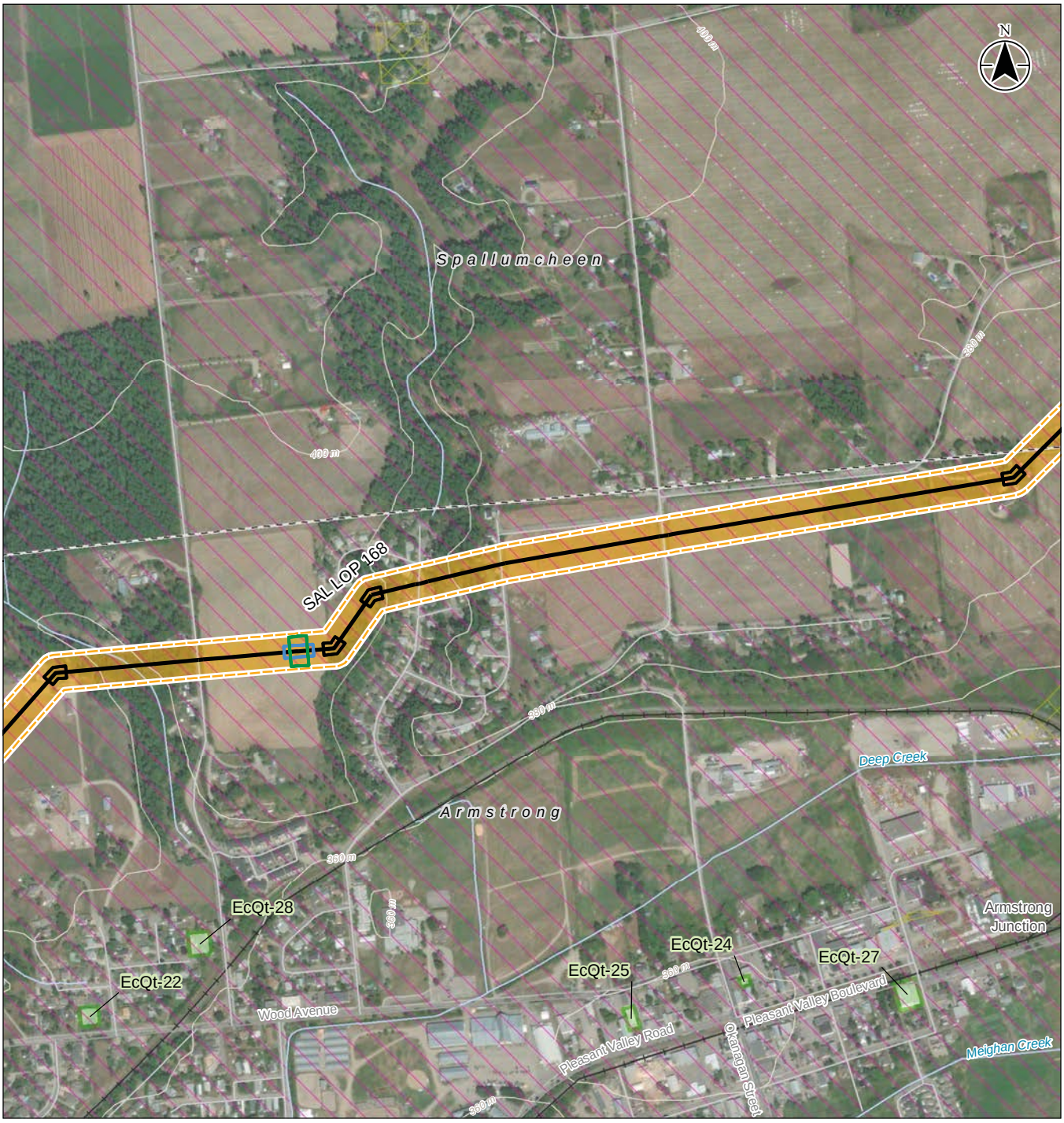

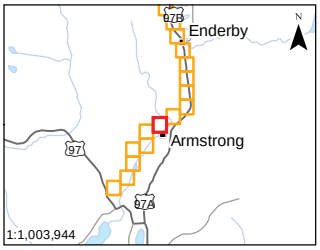

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
Heritage Site - Previously Recorded

Project Areas
Lateral
Study Area
Bend Zone

Tee Zone
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-17

Title
SAL LOP 168

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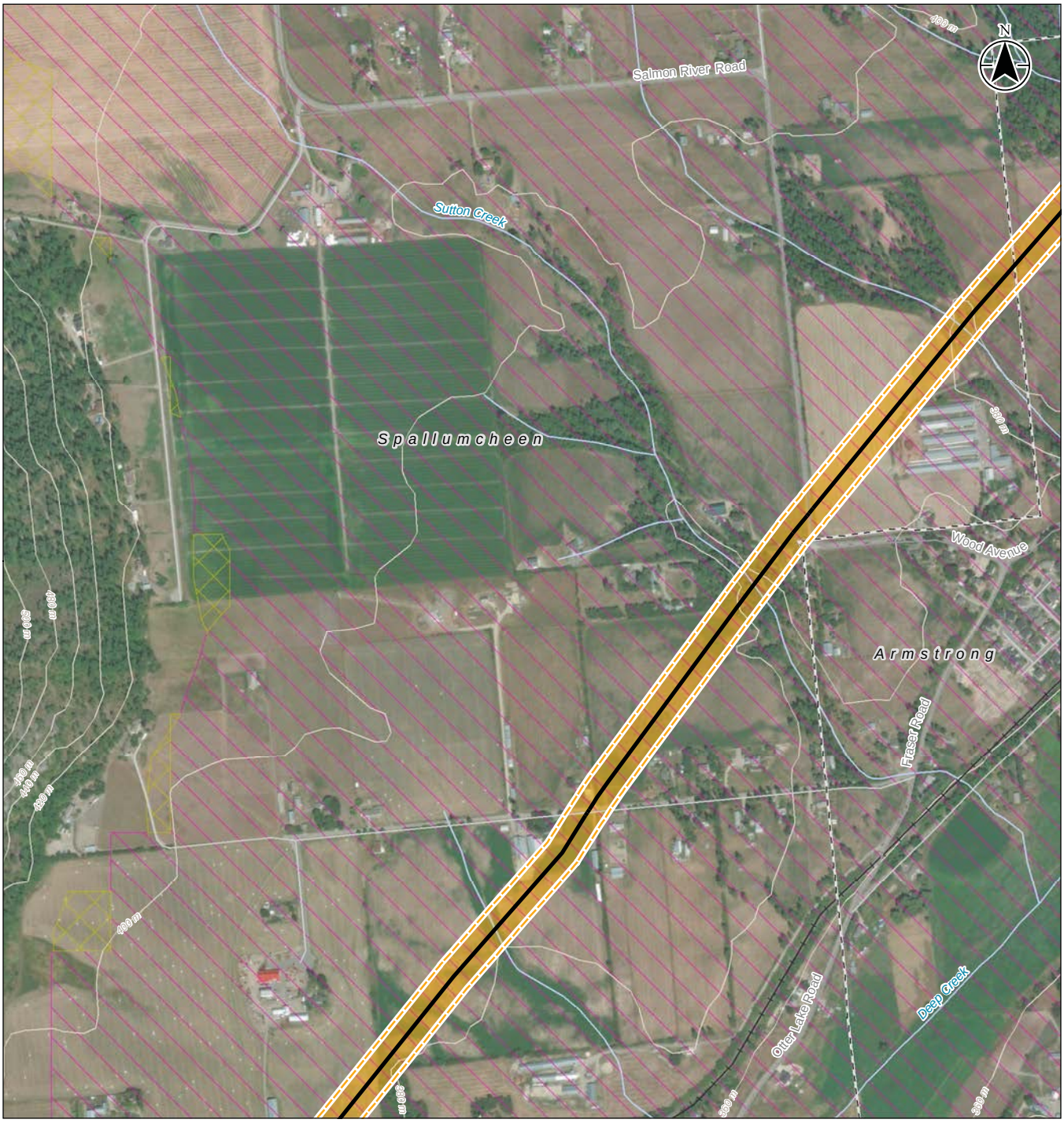

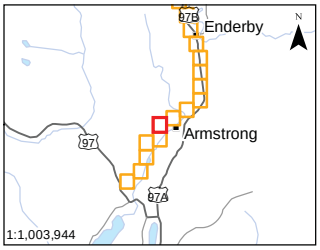

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-18

Title
SAL LOP 168

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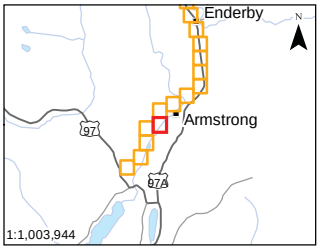

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-19

Title
SAL LOP 168

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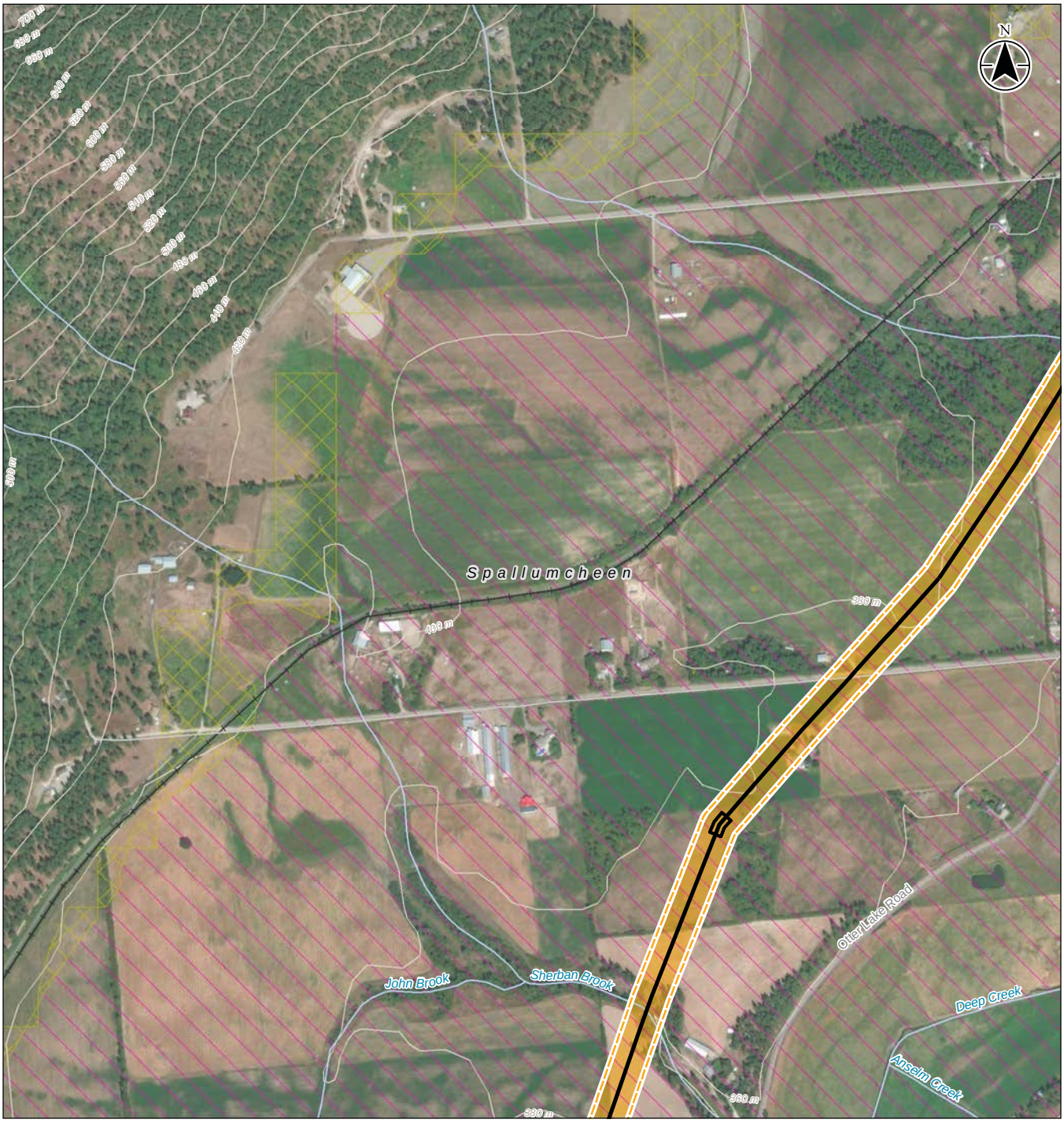

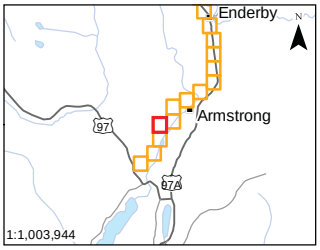

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-20

Title
SAL LOP 168

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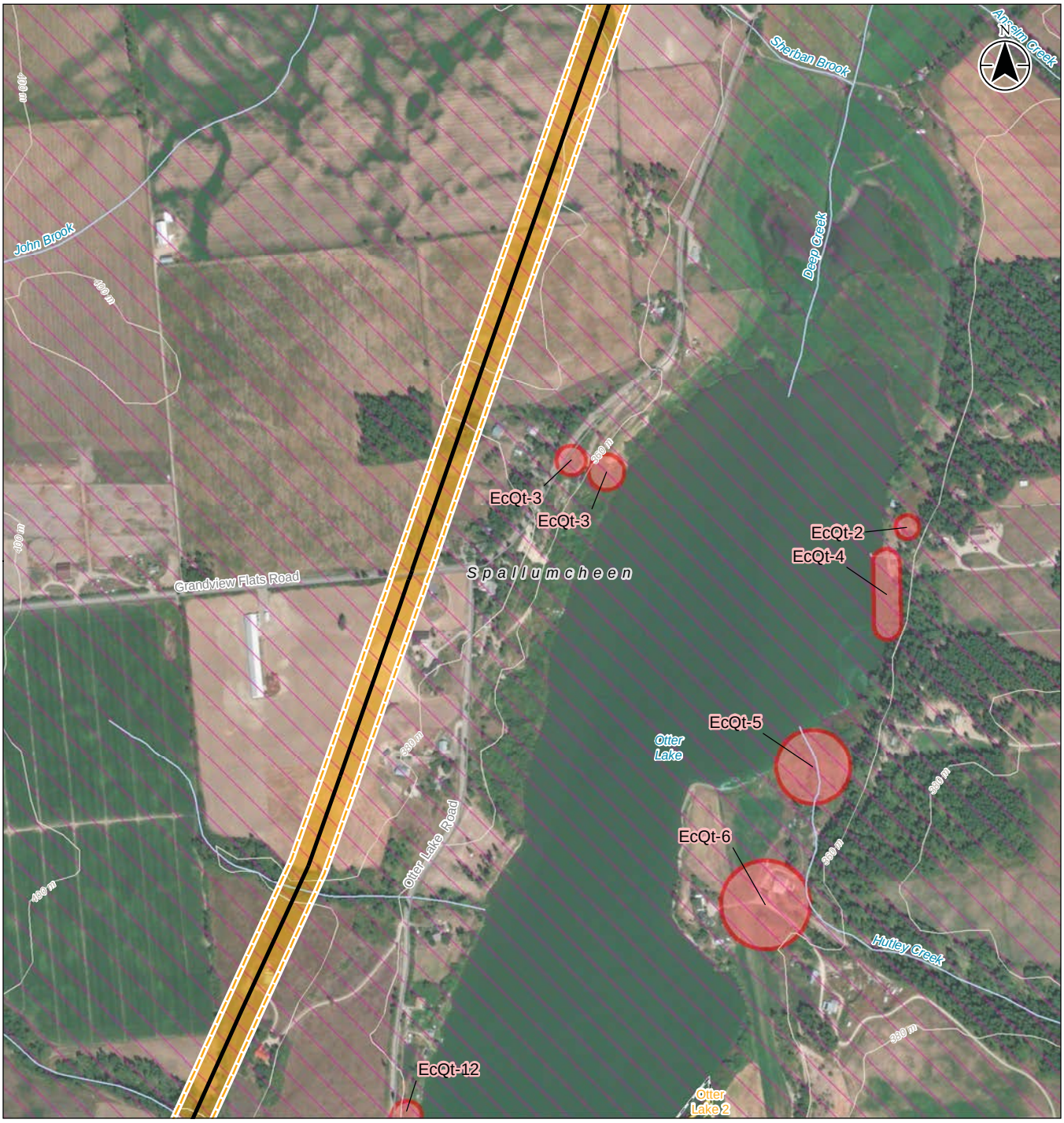

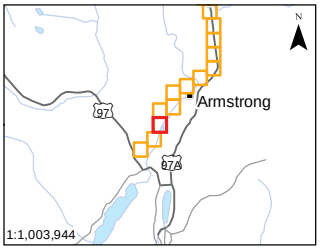

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve
Archaeological Site - Previously Recorded

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-21

Title
SAL LOP 168

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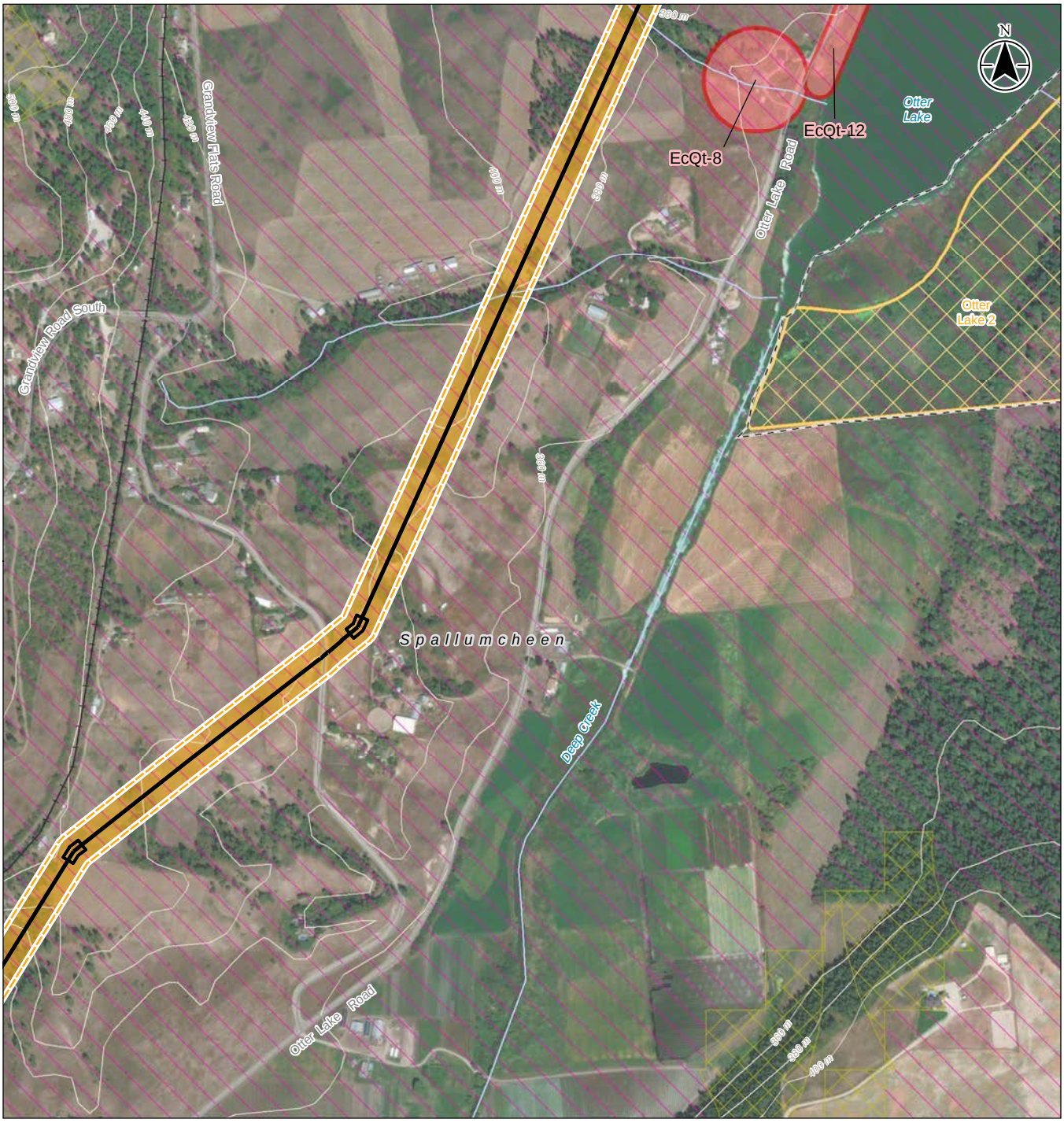

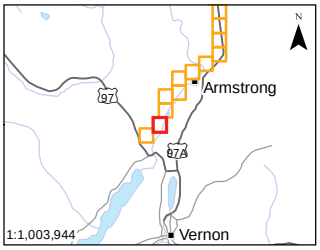

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
First Nations Reserve
Archaeological Site - Previously Recorded

Project Areas
Lateral
Study Area

Bend Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-22

Title
SAL LOP 168

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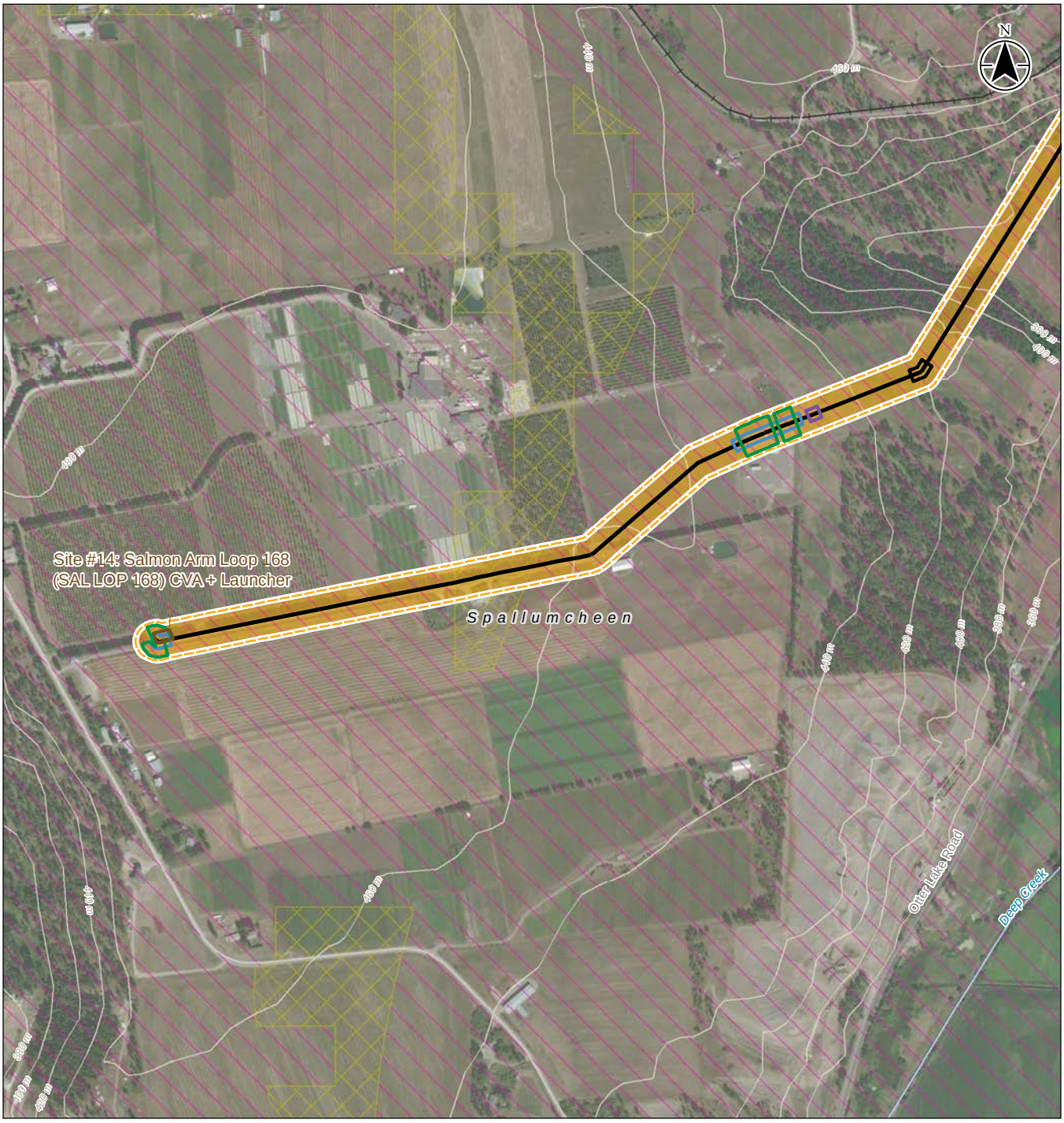

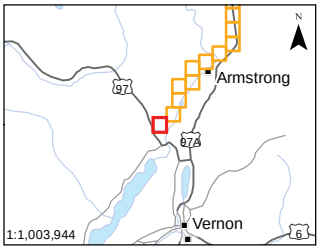

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area
Facility
Bend Zone

Stopper Zone
Tee Zone
Valve Zone

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.2-23

Title
SAL LOP 168

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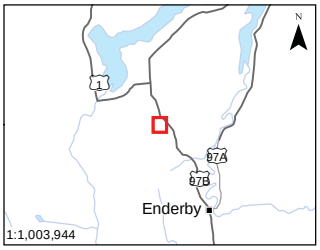

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Road
- Local Street
- Topographic Contour
- Watercourse
- Municipal Boundary

Project Areas
- Lateral
- Other Fortis Lateral
- Study Area
- Bend Zone
- Stopper Zone
- Tee Zone
- Valve Zone

Archaeological Potential Model
- Okanagan AOA - High Archaeological Potential
- Okanagan AOA - Moderate Archaeological Potential

AOA Results
- High Potential - PFR confirmed
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.3-1

Title
SA3 LTL 168

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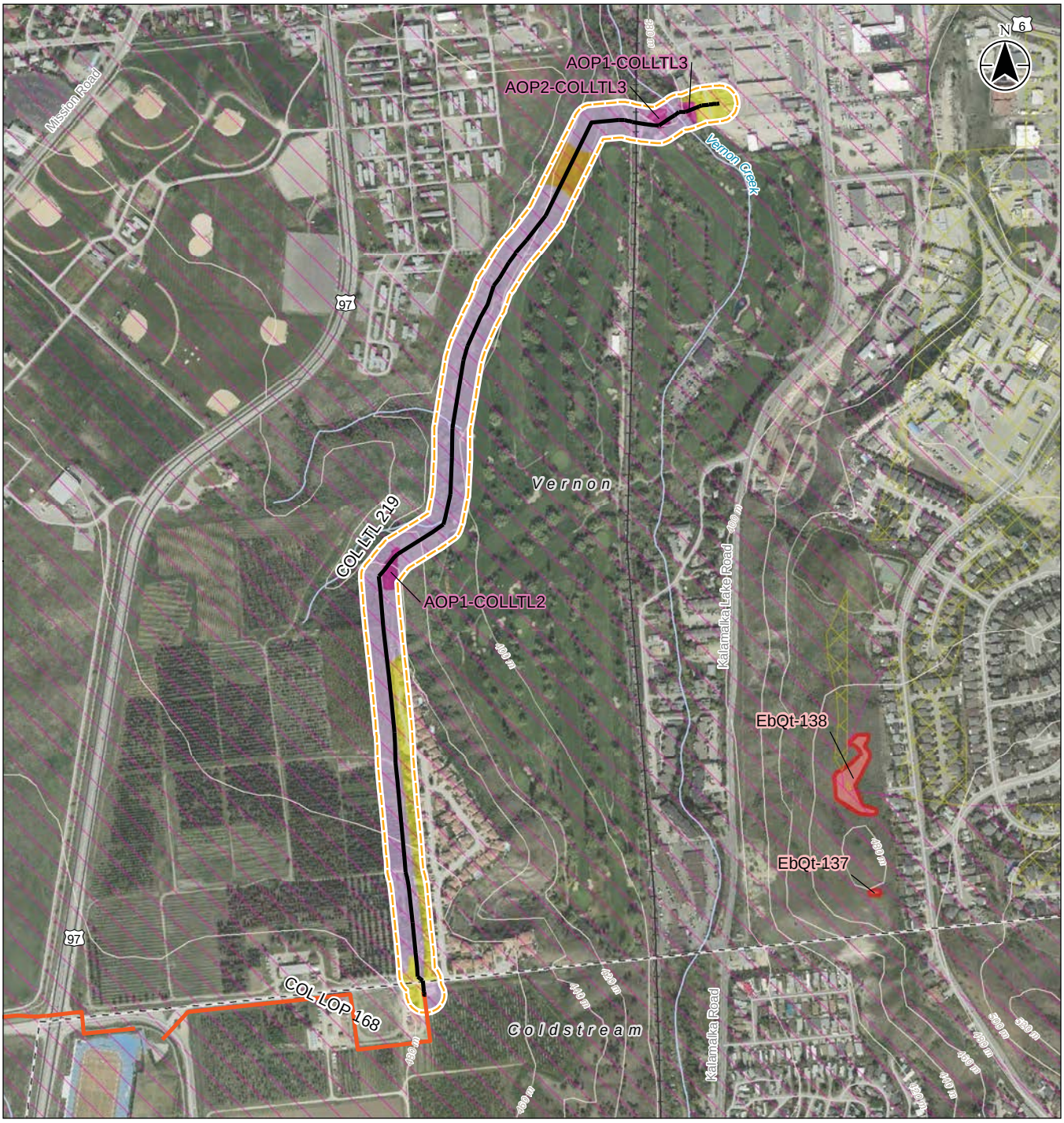

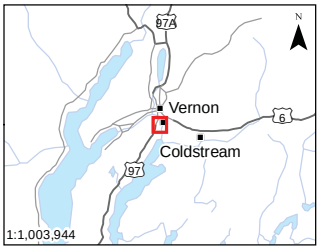

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Highway
- Road
- Local Street
- Railway
- Topographic Contour
- Watercourse
- Municipal Boundary
- Archaeological Site - Previously Recorded

Project Areas
- Lateral
- Other Fortis Lateral
- Study Area

Archaeological Potential Model
- Okanagan AOA - High Archaeological Potential
- Okanagan AOA - Moderate Archaeological Potential

AOA Results
- High - Moderate Potential - Desktop review only
- Low Potential - Desktop review only
- High Potential - PFR confirmed
- Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.4-1

Title
COL LTL 219

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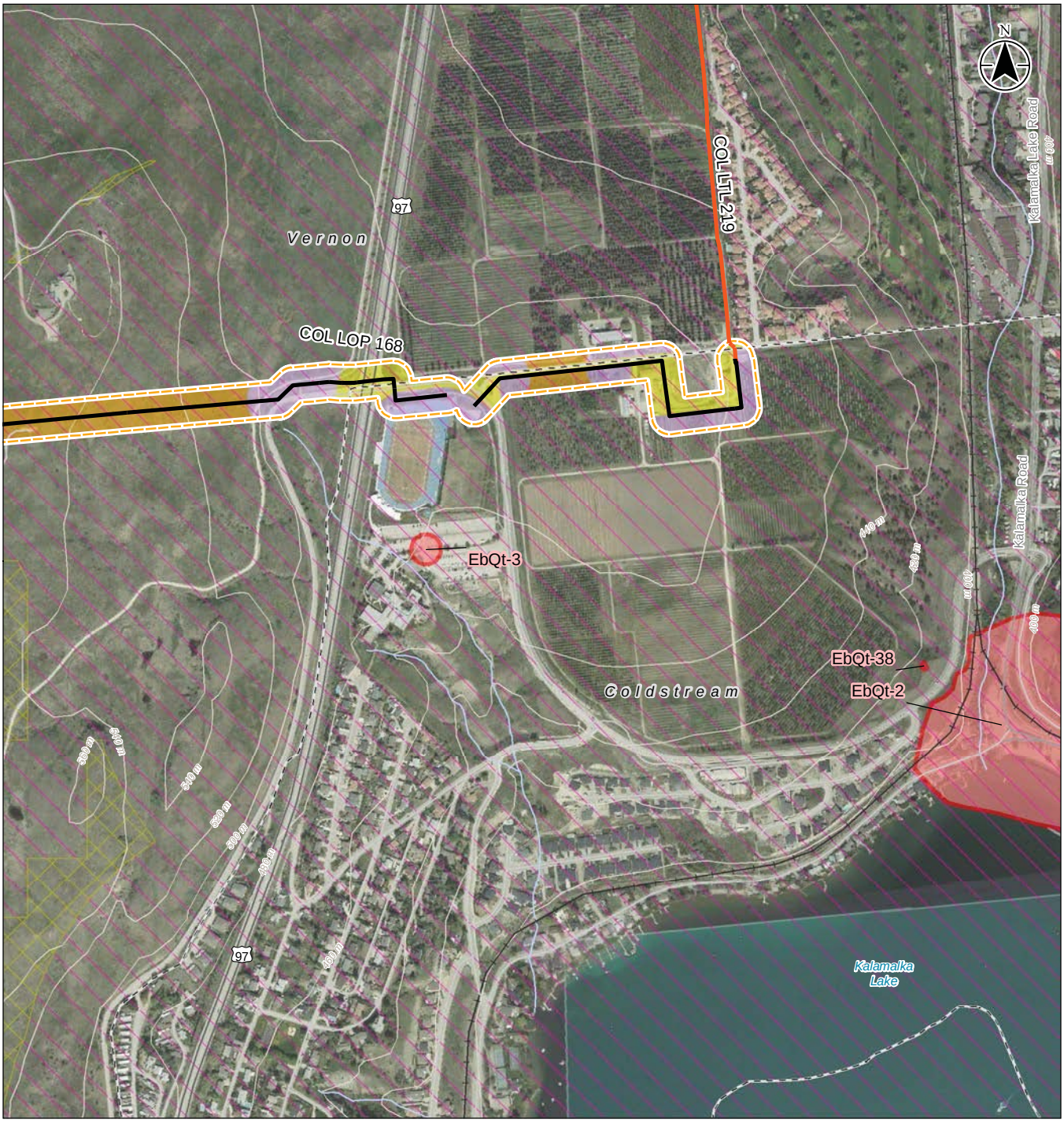

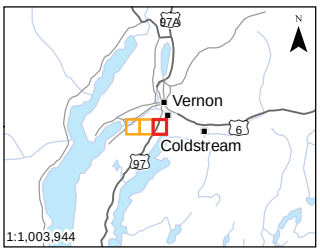

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Highway
Road
Local Street
Railway
Topographic Contour
Watercourse
Municipal Boundary
Archaeological Site - Previously Recorded
Archaeological Site - Legacy

Project Areas
Lateral
Other Fortis Lateral

Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
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Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.5-1

Title
COL LOP 168

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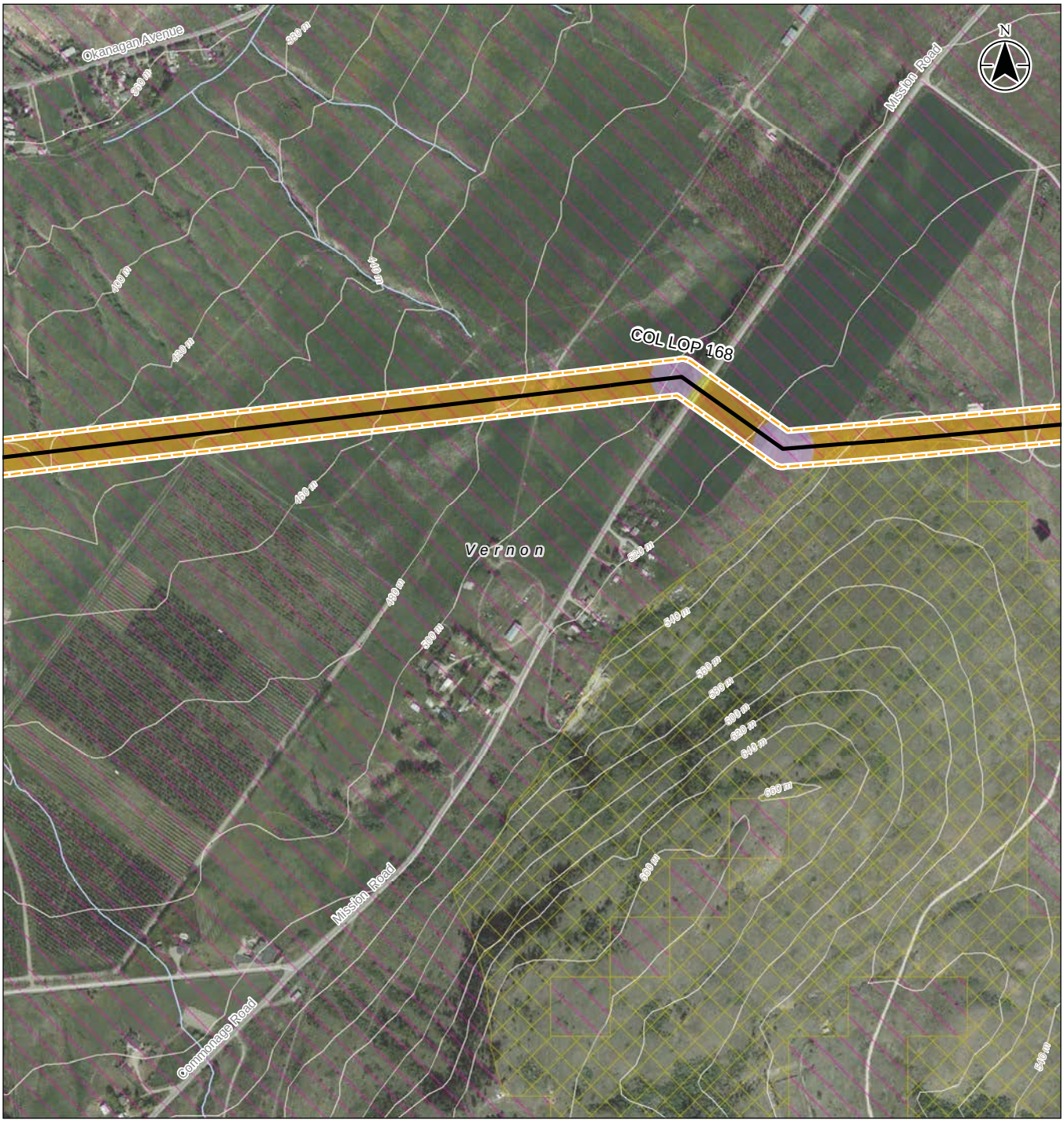

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

Road
Local Street
Topographic Contour
Watercourse
Municipal Boundary

Project Areas
Lateral
Study Area

Archaeological Potential Model
Okanagan AOA - High Archaeological Potential
Okanagan AOA - Moderate Archaeological Potential

AOA Results
High - Moderate Potential - Desktop review only
Low Potential - Desktop review only
Low Potential - PFR confirmed

0 100 200 300 400 m
1:10,000 (at original document size of 8.5x11)

Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

Client/Project/Report
FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
B.5-2

Title
COL LOP 168

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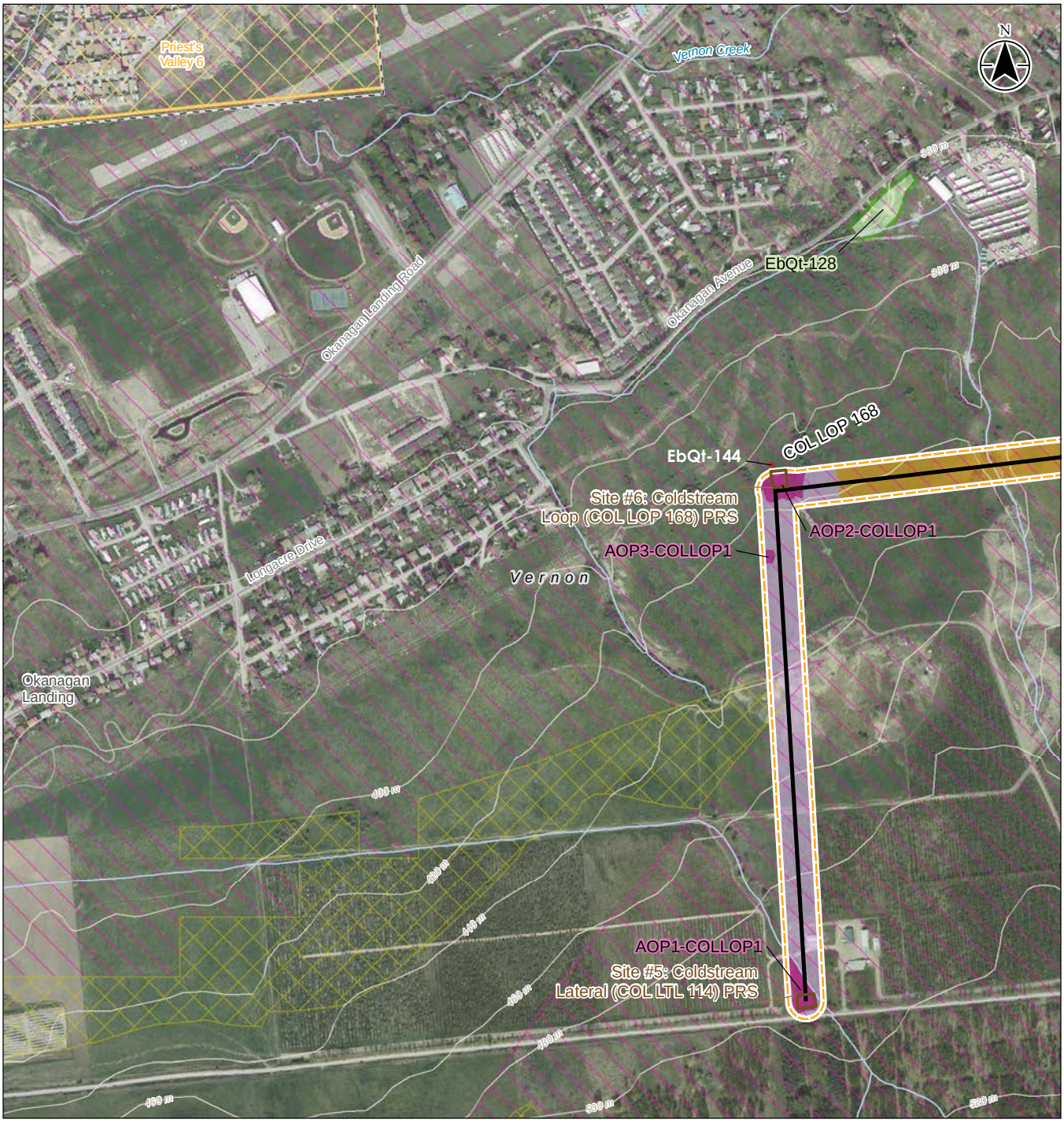

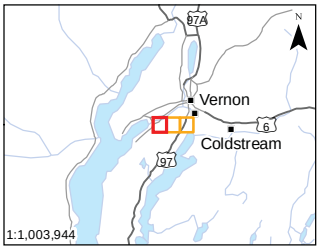

Notes
1. Coordinate System: NAD 1983 BC Environment Albers
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Orthoimagery: ESRI World Imagery

- Road
- Local Street
- Topographic Contour
- Watercourse
- Municipal Boundary
- First Nations Reserve
- Archaeological Site - Newly Recorded
- Heritage Site - Previously Recorded

Project Areas
- Lateral
- Study Area
- Facility

Archaeological Potential Model
- Okanagan AOA - High Archaeological Potential
- Okanagan AOA - Moderate Archaeological Potential

AOA Results
- High - Moderate Potential - Desktop review only
- High Potential - PFR confirmed
- Low Potential - PFR confirmed

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Stantec FORTIS BC

Project Location

Project Number 123221089
Prepared by DJOZSA on 20180716
Discipline Review by RCOMMISSO on 20180803
GIS Review by TCARDINAL on 20180803

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

Figure No.
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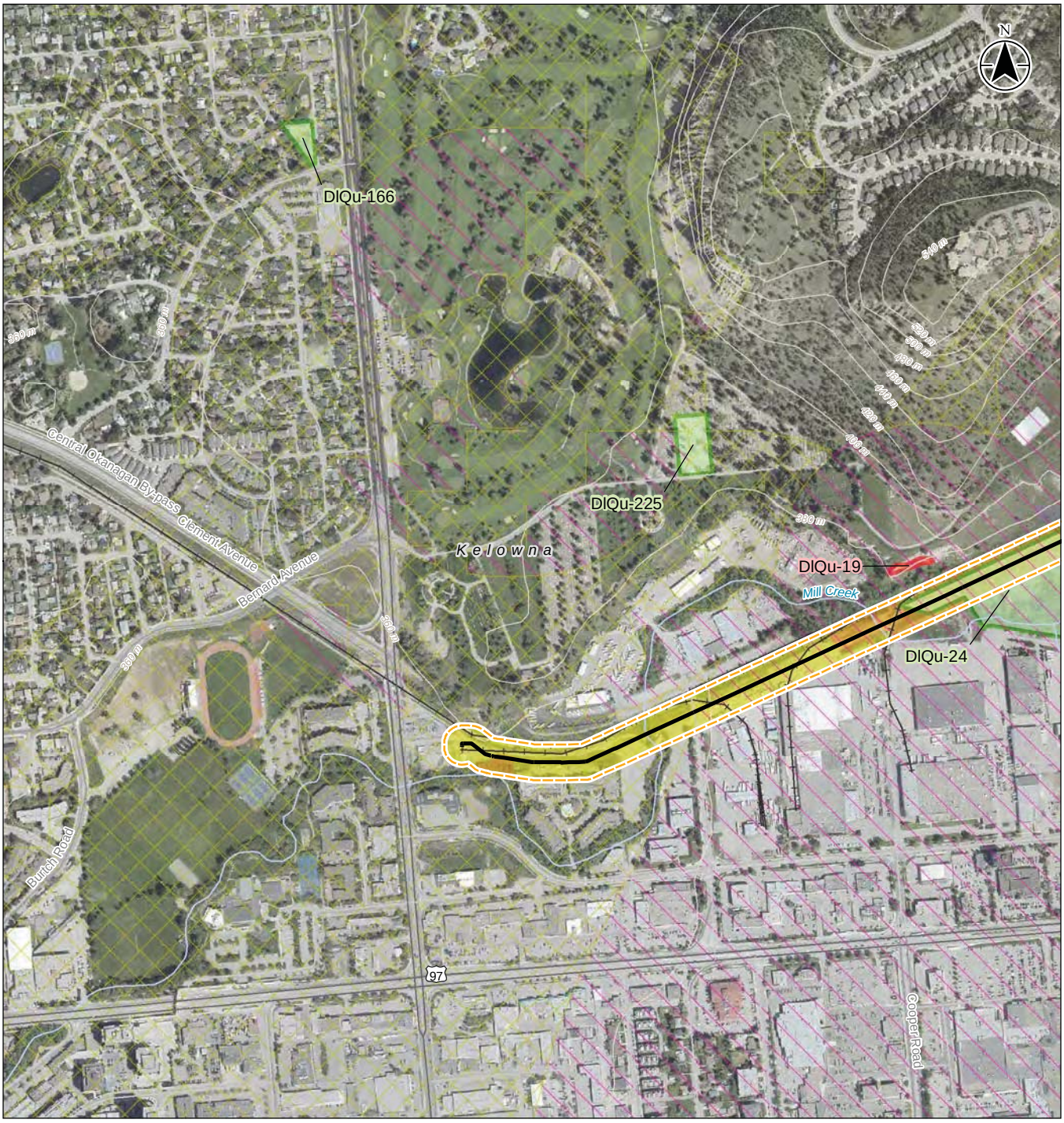

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Highway
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Railway
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Municipal Boundary
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AOA Results
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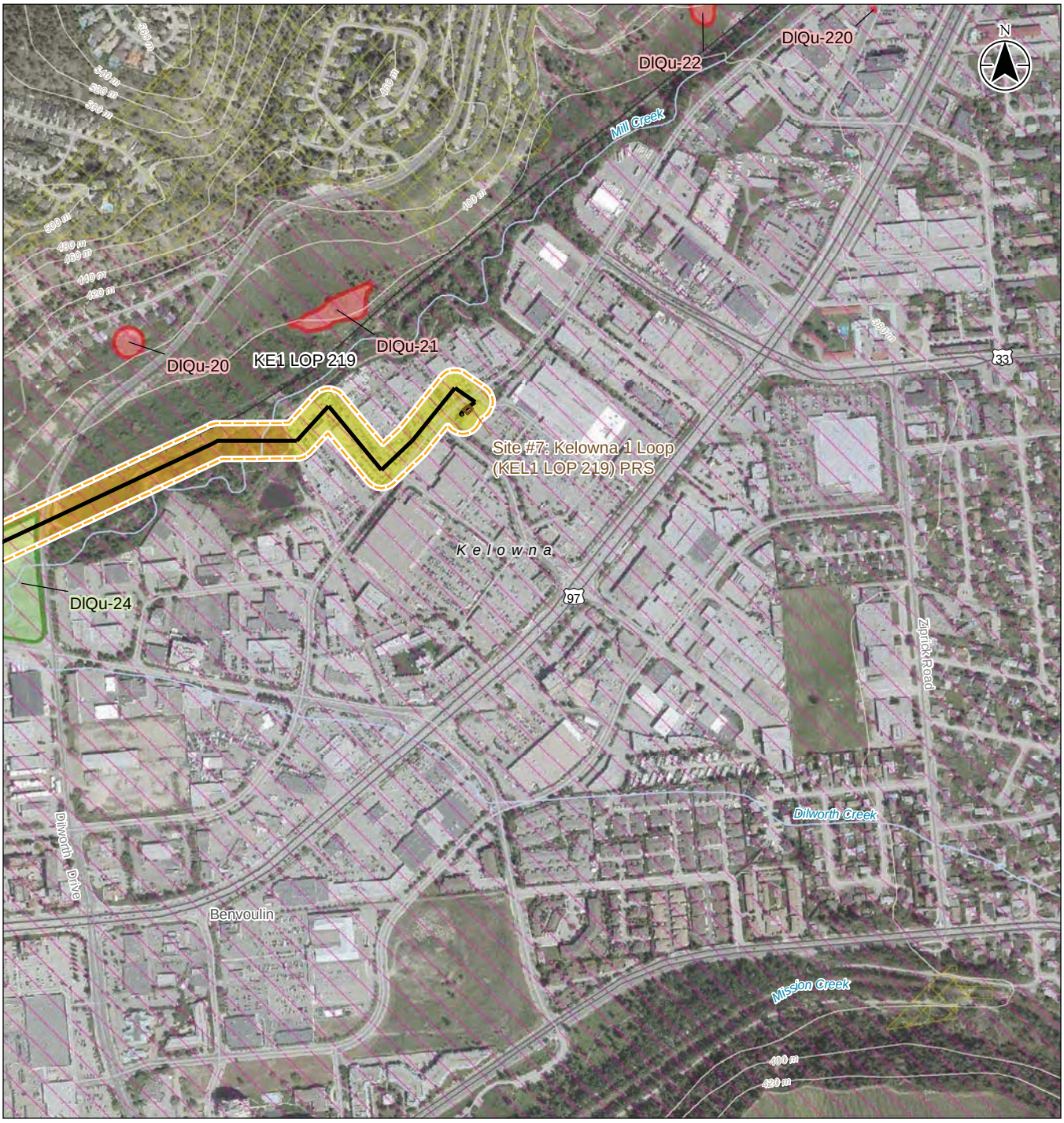

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AOA Results
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Low Potential - Desktop review only

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Stantec FORTIS BC

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FortisBC Inland Gas Upgrades Project
Set1 & 2 Archaeological Overview Assessment

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Archaeological Overview Assessment of FortisBC Energy Inc.'s Proposed Inland Gas Upgrades Project

Set 3 - Kootenay Region

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Report Submission:
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1 Introduction

This report comprises an Archaeological Overview Assessment (AOA) of the FortisBC Energy Inc. Inland Gas Upgrades project, Set 3, southeastern British Columbia.

The overall objective of this AOA was to provide an assessment of archaeological risks for the laterals, and to gather sufficient information to be able to estimate the probable scope and cost of the future archaeological work that would be needed for each lateral option; either Archaeological Impact Assessment [AIA] (including shovel testing) on the level of whole line replacement or AIA of the In-line Inspection (i.e. assessment of areas identified for testing during the Preliminary Field Reconnaissance [PFR]). FortisBC will use this information to compare the potential risks and estimate the costs for the two options in the CPCN application as part of the supporting rationale for the determinations of preferred options. Specific objectives of this AOA were to (1) identify recorded archaeological sites, if present, within the study area; (2) evaluate the potential for unrecorded sites within the study area; and, (3) provide recommendations for additional archaeological study, if/where required for future development.

This report conforms to Provincial Guidelines (Archaeology Branch 1998) in summarizing the environmental and cultural background information pertaining to the operational study area and describing the methods employed and results attained in the assessment. The study results are based on analysis and synthesis of the various archaeological investigations and models, and are presented as mapped vectors and polygons of archaeological potential accompanied by databases containing information pertaining to the biogeographic settings of the locations of potential concern.

2 Study Area

2.1 Biophysical Setting

2.1.1 Modern Environmental Background

The modern climate is strongly influenced by Pacific maritime airflow which interacts with topography to create storm tracks and rain shadows. Continental climate influences are stronger to the east of the Purcell Mountain crest. The combination of these factors produces west-to-east clines in precipitation and temperature; there is also a west-to-east trend in the increase in elevation of the valleys traversed by the various pipeline laterals.

The high level of biodiversity also reflects these trends. The valley bottoms of the Elk River and the Rocky Mountain Trench support Douglas Fir and Ponderosa Pine savannah grasslands whereas those of the lower Kootenay and Columbia rivers are temperate Interior Cedar - Hemlock rainforests. Cooler temperatures at higher elevations are reflected throughout the Set 3 project area in closed canopy Engelmann Spruce - Subalpine Fir forests.

Fire is another factor affecting vegetal community composition: birch, lodgepole pine and larch are prominent tree species due to widespread fires around the turn of the century. Fire ecology produces the most favourable habitat for deer, elk and moose; ungulate capability is considerably lower in mature cedar hemlock forests. South- and west-facing lower valley walls and riparian zones provide the highest quality winter range. A wide range of other large and small mammals and numerous bird species also inhabit the mosaic of vegetal communities that flank the watercourses.

The presence of kokanee salmon in Kootenay Lake indicates that at some time in the past, anadromous salmon ascended into the lake before becoming landlocked by the falls on the lower Kootenay River; they continued to ascend the Columbia River to its headwaters until the runs were blocked by the construction of hydroelectric dams in the United States. The Columbia, Kootenay and Elk rivers previously supported very large resident fish populations which included rainbow and bull trout, ling cod, whitefish and sturgeon; these are also now much reduced as a consequence of modern land and resource practices.

2.1.2 Geology and Palaeohydrology

The study areas for this AOA comprise sections of four major valley systems, from east to west, the Elk River valley, the Rocky Mountain Trench, the lower Kootenay River valley and the Columbia River valley. These valleys are situated within and surrounded by a part of the North American Cordillera, here consisting of a series of north-northwest – southeast trending folded and faulted mountain ranges that are separated by the dominant valleys but are occasionally broken by large east-west faults. More specifically, parts of the southern Rocky, Purcell and Selkirk mountains are represented, being constituted of a series of bedrock strata extending in age from late Precambrian time through to the Tertiary and covered with a relatively thin mantle of Pleistocene glacial till and proglacial drift capped by unconsolidated postglacial sediments and soils. These mountains are the product of a complex sequence of orogenic processes that created sedimentary and low grade metamorphic rocks ranging from the thick strata of limestone, argillite and quartzite that dominate the Rocky and Purcell Mountains to steeply tilted sedimentary and metamorphic strata of marble, greenstone, amphibolite, schist and gneis. More localized occurrences of volcanic and intrusive rocks include Precambrian lava flows, diorite dykes and sills and Jurassic and Cretaceous granodioritic plutons.

The upper elevations of the mountains are characterized by cirques and U-shaped upper valleys scoured by ice tongues, above which are a few isolated nunataks. The intervening landscape of the valleys of the major watercourses has been heavily sculpted by larger scale glaciation and exfoliation of the plutonic masses to form long slopes and rounded knolls, ridges and structural benches of scales ranging from tens of metres to kilometres in length. Glacial moraine and colluvially reworked till are the predominant surficial deposits in the highest project areas, below which are more complex and variable sediments that resulted from the deposition and reworking of glaciofluvial and glaciolacustrine sediments. These constitute broad plains on the floors of the wide Elk Valley and Rocky Mountain Trench while the project area landscape along the steeper lower Kootenay and Columbia River valleys contains localized elevated delta-fan terraces graded to previously higher lake levels. Tributary confluences at lower elevations are typically associated with the development of alluvial fans. All of the Segment 3 project laterals cross recent watercourses in the valley bottoms; these are flanked by fluvial and alluvial deposits related to the evolution of the Holocene drainage network.

Most of the lengths of the various laterals are across terrain that is at some distance above the elevations of the major watercourses, only dropping to make crossings. Therefore, much of the high archaeological potential terrain that overlaps with the locations of proposed appurtenances is of early postglacial age. The following summarizes what is known about the evolution of this landscape. It expresses an east to west differential in timing and extent of ice and water that resulted from the global climate influences and the resulting temperature and precipitation gradients described above.

At the peak of Pleistocene glaciation, a coalescent ice mass covered the southern Purcell and Selkirk mountains while the Rocky Mountains were scoured by cirque-fed valley glaciers. The intervening Rocky Mountain Trench was occupied by a large trunk glacier, as was the Elk Valley. During the retreat, ice was shed from the highest elevations first and the peripheries of the various valley glaciers and downwasting ice masses interfaced with proglacial lakes. The resulting terrain comprises a broad array of landforms ranging from disintegration moraine and washed till through spillways and ice-marginal meltwater channels to glaciofluvial valley train terraces and paraglacial fans. There is frequently little topographic relief expressed between the various East Kootenay deglacial deposits, which are definable largely by their sedimentological characteristics. These range from boulder-clay ground moraine and laminated glaciolacustrine silts and clays to poorly sorted boulder and cobble outwash of both glacial meltwater and catastrophic floods. A radiocarbon date from the Elk Valley indicates that Glacial Lake Elk, which inundated the lower elevations of the southern two-thirds of the Elk drainage (Harrison 1976), had drained before 14,000 calendar years ago (cal BP). Approximate temporal benchmarks for deglaciation of the southern Rocky Mountain Trench are provided by Glacial Lake Kootenai which occupied the middle Kootenai River drainage in northwestern Montana at an elevation of about 762 m a.m.s.l. (Alden 1953). Both Mt. St. Helens J and Glacier Peak G tephras were deposited in it (Mierendorf 1984), the former dating to about 13,700 cal BP, the latter to ca. 13,100 cal BP. Another age estimate for the abandonment of the 762 m stand is provided by a date of 13,829 + 560 cal BP on charred plant remains collected from the earliest burned surface within the basal alluvium of a fluvially graded terrace (Mierendorf 1984). Extrapolating this evidence 100 km north into the Cranbrook-Kimberley laterals/loops project area indicates that most of the terrain was available for human occupation by at least 13,000 years ago.

To the west, the ice mass disintegrated into the narrow steep-sided West Kootenay valleys that filled with ice-marginal lakes into which kame and delta-kame terraces were deposited, landforms likewise differentiated on the basis of sorting and stratification. Glacial Lake Columbia (GLC) appears to have been the largest of these proglacial lakes, created by damming of the Columbia River by the Okanagan Ice Lobe in the vicinity of the Grand Coulee in present-day Washington. The elevation of this lake fluctuated as the various spillways were buried and exposed by advances and retreats of the ice front and there is evidence (e.g. Kahle et al 2003) indicating that the Okanagan Ice Lobe continued to dam the middle Columbia River after the more easterly Cordilleran ice lobes had retreated from their maximum extents. GLC had a maximum elevation of as much as 732 m and temporary spillways at ca 717 m, 710 m, 702 m, 685 m, 671 m and 663 m. Most of the West Kootenay laterals are below these elevations, traversing a considerable extent of level terrain that appears to be graded to two significant lower stands of GLC at about 600 m and 500 m (Choquette 1996, USGS 2005). It is apparent that the 600 m stand existed for a significant duration, indicated by widespread and extensive terraces of stratified silt at this elevation along the Columbia and Kootenay rivers in BC while the high terraces at the Castlegar Airport and Shoreacres are graded to the 500 m GLC stand. The absolute age of GLC is uncertain but based on varve analyses, it apparently lasted 2000 - 3000 years (USGS 2005) and it has been determined that the Okanagan ice lobe had retreated from the Columbia River valley by 13,500 cal BP (Hanson 2013: 76). An extensive series of radiocarbon dates from the Selkirk Trench indicate that both the 600 m and 500 m GLC stands had disappeared from the upper Columbia drainage before 10,000 years ago (Choquette 1996).

Drainage of this large lake was accompanied by the establishment of spillways east of Castlegar at 580 m and at the outlet of Kootenay Lake at 572 m that existed until the lower Kootenay River established its present course at Brilliant. After this, local drainage was established and watercourses began eroding their way through the thick valley fills. As this lowering of the local hydrological baseline took place, deposits on the valley walls were channeled out, leaving steep,

unstable slopes above the creeks (Wallace et al 1998) and in the process, a series of elevated terraces were carved and some elevated fans were dissected. Sediments were removed from the West Arm outlet channel until bedrock outcrops in the valley bottom were exhumed, creating a series of major waterfalls. The freshly exposed sediments and surfaces resulting from these erosional processes were reworked by gravity and the wind to varying degrees before becoming stabilized by vegetation.

2.1.3 Palaeoecology

Pollen studies (summarized in Choquette 1996) indicate that 14,000 or more calendar years ago, the upper Columbia River drainage area was being colonized by an open "steppe tundra" vegetation of sage and grasses, scattered birch, spruce and fir, and cattails along lake margins. The dated charred plant remains on the early Kootenay River floodplain mentioned above indicate that fire was already part of the regional ecology before 13,000 calendar years ago. Dense coniferous forest invaded the valley bottoms and mountainsides around 12,500 calendar years ago, but its structure and species composition did not resemble that of the modern forests until well after 8000 BP. Vegetal community composition reflected the Continental climate influence, varying most strongly with altitude and latitude. The 11,500 - 8,000 cal BP interval was characterized by drought and the highest forest fire frequency of the entire post-glacial period (Choquette 1987a); Douglas fir savannah was widespread regionally while sagebrush-grassland and ponderosa pine savannah would likely have predominated in the southern Rocky Mountain Trench.

A major change in climate occurred after about 8000 cal BP, when the Pacific maritime westerlies began to exert greater influence (ibid.). In response to increased rainfall, the predominant trend in vegetal configuration became longitudinal and the Purcell Mountains became a significant climatic divide. Forests on west-facing windward slopes became denser but the adiabatic “Chinook” or rain shadow effect resulted in persistence and even expansion of grasslands in the Rocky Mountain Trench and along the East Slope of the Rocky Mountains. At first, the Maritime influence was a moderating one, but about 6000 cal BP, a significant global cooling trend known as the Neoglacial began to affect the region. Small glaciers developed in high mountain cirques, forest fire frequency declined about 4500 years ago, and closed canopy forests expanded at the expense of grasslands and parkland throughout the region. This was accompanied by significant compositional changes in the vegetation as the maritime associations made their appearance and the vegetal mosaic became more complex. This cool, moist trend apparently reached its maximum expression during the early Neoglacial between 4500 and 2500 cal BP (Baker 1983, Hallet and Walker 1999) when rivers and wetlands increased in size due to increased precipitation, especially snowfall. Aquatic and riparian communities flourished in response to greater fluvial discharge and higher local water tables. Based on models of past salmon carrying capacity derived from regional palaeoenvironmental data (Choquette 1985a, 1987a), climatically induced variations in fluvial discharge and sediment load would have affected salmon carrying capacity, the early Neoglacial period of high fluvial discharge and relative probably fostered large salmon runs up the Columbia and its tributaries.

After about 2500 BP, the climate became warmer and drier again under a return to more Continental climatic influences, reaching a second, albeit shorter and less intense, drought interval between about 1500 and 450 BP. Forest fire frequency and grasslands again increased, resulting in a rejuvenation of grazing ungulate populations compared to the preceding period; this included the expansion of bison into the Elk Valley and southern Rocky Mountain Trench (Choquette 1973, 1987b). The notable later Neoglacial decrease in fluvial discharge compared to

the previous interval would have negatively impacted the salmon carrying capacity of the upper Columbia River drainage.

The final episode in the region's palaeoclimate is known as the "Little Ice Age": during the last 400 years, glacial ice in the Northern Rocky and Columbia mountains reached its greatest extent since the Pleistocene. The environmental effects were apparently severe, resulting in the disappearance of two species of grazers (bison and antelope) from the southern Rocky Mountain Trench (Johnson 1969).

3 Cultural Context

3.1 Ethnographic Setting

At the time of European contact, the Set 3 study area overlapped parts of the territories of speakers of two distinct linguistic families, the Ktunaxa, speakers of a unique language, and the Salish speaking Okanagan and Secwepemc peoples.

By late precontact time, the Ktunaxa had evolved into four geographically and linguistically distinct subdivisions, the ranges of the Upper and Lower Ktunaxa encompassing the Kootenay River drainage. The Ktunaxa Nation is represented politically by the Ktunaxa National Government (www.ktunaxa.org). The major ethnographic works on the Ktunaxa are Schaeffer (1940) and Turney-High (1941); Smith (1984) and Brunton (1998) have compiled recent syntheses.

Lands within the western part of the study area are part of a territory claimed by the Okanagan Nation Alliance. According to a statement by Marilyn James, Spokesperson for the Sinixt-Arrow Lakes First Nation (1995: 4 cited in Handly et al 1996: 27), Sinixt traditional territory corresponds to the area delineated by ethnographer Verne Ray (1936: 114, Figure 2) which includes the Kootenay River drainage below Kootenay Lake. Speakers of a dialect of the Okanagan language, the major ethnographic work on the Sinixt is by Bouchard and Kennedy (1985, 2000) and Pryce (1999).

The study area is also within the asserted traditional territory of the Secwepemc, speakers of a different Salish language who inhabited much of the Fraser, Thompson and upper Columbia drainages. At the time of contact, the eastern periphery of this range was inhabited by several small nomadic groups of Secwepemc who travelled widely throughout the northern Columbia and Rocky Mountains. Teit's 1909 and 1930 accounts and Ignace's 1998 work comprise the bulk of written data for the Secwepemc.

3.2 Archaeology

Adequate and relevant predictive models are required to project archaeological potential onto the landscape coincidentally occupied by FortisBC infrastructure. These models are derived from the archaeological record which is itself derived from the results of archaeological investigations. Most have consisted of archaeological assessments conducted in response to individual development projects of a range of scales. Sampling and methodology are driven by industrial economic variables which introduce biases that affect the record in various ways. Inconsistent terminology and implicit judgemental criteria reduce the utility of much of the information that has been generated, and necessitate filtering of the biases.

In general, the Set 3 loops and laterals are divisible into three biogeographic subregions: the Elk Valley, the southern Rocky Mountain Trench, and the lower Kootenay-Columbia. This tripartite

division is also reflected in the character of the archaeological investigations and of the resultant archaeological record. The following summarizes the archaeological records of the three discrete biogeographic localities of Set 3; more detail is presented in Choquette (1984, 1987a and b, 1993, 1996, 2007b).

3.2.1 Elk Valley

Much of the archaeological work in the Elk Valley has been part of a longstanding regional effort that strives to combine the requirements of both research and resource management. For this locality, there exists a coherent set of hypothetical precontact human land and resource use models that are amenable to testing via systematically controlled archaeological data recovery methods.

3.2.1.1 Previous Investigations

The Fortis Fording and Elkview laterals traverse terrain within the middle Elk River drainage area, which was subject to a 1973 archaeological inventory survey in anticipation of expansion of coal mines (Choquette 1973). The study area included the Elk Valley from Sparwood to Elkford and extended up the tributary valleys of the Fording River and Michel Creek. Survey coverage was judgmental, focussing primarily on terraces and fans. A total of 67 precontact archaeological sites was recorded and three previously recorded sites were revisited. Site settings, content and distribution led to the initial inferences regarding the area's past human inhabitation which were developed into an hypothetical model that was explicitly tested in 1976 during the survey of the proposed Line Creek, Corbin and Hosmer-Wheeler coal mines (Choquette 1979).

Following but not necessarily related to the foregoing surveys, archaeological work of varying but generally increasing degrees of intensity has subsequently been carried out over the past four decades on the five coal mines now owned by Teck Coal Ltd. (Greenhills, Fording River, Line Creek, Elkview and Coal Mountain) as well as a number of smaller mining proposals. This work ranges from AOAs and brief reconnaissances through inventory surveys to impact assessments and conservation excavations.

An archaeological inventory and assessment of the then-proposed Greenhills Coal Mine was undertaken in 1979-80 (Aresco 1980). The survey area was the south half of Greenhills ridge including its south slope. Two precontact sites were discovered on low terraces adjacent to the Fording River and a third site was found on an alluvial fan just to the southeast. Areas of proposed expansion of this mine were examined in 1986 (Aresco 1986) and 1995 (Choquette 1995a); one precontact site was found on a high terrace overlooking the Elk River during the former study.

A proposed gravel pit expansion in a grassland opening on the northeast side of the mouth of Chauncey Creek in the Fording River valley was examined in 1990 (Choquette 1990a). No evidence of precontact human presence was encountered. Proposed construction of a railroad siding in the Fording Valley south of Kilmarnock Creek prompted an Archaeological Field Review which identified a potential conflict with previously recorded site EaPr-12 (Choquette 2011a). Construction monitoring ensured that the flagged site was not affected by the siding construction (Choquette 2011b).

Aresco Ltd. conducted a heritage impact assessment of the expansion of the Balmer coal strip mine in 1982 (Warner 1983). Emphasis was on foot traverse survey of Harmer and Erickson creeks with shovel testing at 50 m intervals - these areas were emphasized because they were the most intact; south- and west-facing parts of the ridge were not surveyed. No sites were found.

In the southernmost portion of the study area, the route of the proposed expansion of the Alberta Natural Gas pipeline was surveyed in 1975 (Reeves and Head 1976), resulting in the recording of a cluster of precontact archaeological sites at the west end of the Crowsnest Pass.

Archaeological assessments have begun to be conducted in advance of proposed logging throughout the study area. AOAs were prepared for Crown land in Landscape Units C19, C21, C23 and C38 (Choquette 1997, 2002, 2003a and b), followed by an AOA of Managed Forest 27 (Choquette 2008). Numerous precontact sites, most of them subsurface lithic scatters, have been recorded during the archaeological impact assessments arising from these AOAs.

3.2.1.2 Culture History

The date of initial human occupation of the Elk River drainage is not known but palynological evidence indicates that the area could support an ecology containing humans 12,000 or more calendar years ago. In the adjacent regions, archaeological complexes of the Stemmed Point Tradition with antiquities on the order of 11,500 - 13,000 cal BP occur within the drained basins of the earliest proglacial lakes, where they have been documented as the Goatfell Complex of the Purcell Mountains to the west, the Banff II Complex in the Bow River Valley to the northeast, the Livingstone Complex in the Crowsnest Pass and the Lake Linnet Complex in Waterton. The cultural deposits contain only sparse, scattered fire broken rock and west of the Divide, almost no bone, the latter probably due to poor preservation in acidic soils. A primarily hunting-based economy is indicated by the predominance of spearpoints, knives and scrapers in the tool assemblages and by the generally upland orientation of the settlement pattern.

Data from the immediate vicinity of the Elk drainage supports the hypothesis that the higher elevations may have been more heavily utilized during the droughty fire-prone interval between ca. 11,500 and 7800 years ago, which fostered open canopy forests and extensive high elevation grasslands with their attendant high ungulate capability. For example, inferred game drives at Top of the World (Choquette 1985b) and shared meat portions in the Crowsnest Pass area (Driver 1982), to the west and east of the Elk Valley, respectively, point to communal hunting as the means whereby mountain sheep were procured during early Holocene times. Bison and sheep hunting are well represented in the East Slope valleys, and in some cases, lake fishing. Winter camps were situated in the main valleys while seasonal camps and resource exploitation areas occurred in tributary valleys and alpine settings. According to Perry and Langemann (1997), this basic land and resource use pattern was established by ca. 9000 years ago and apparently also characterized later precontact times, a parallel to Jonathan Driver's (1978) "herd hunter" model developed for the Crowsnest Valley.

Based on this model, Driver (ibid.: 166) indicates that "sites were located seasonally to take advantage of the distribution of ungulate herds, and the changing behaviour of these herds throughout the year influenced hunting patterns". Following Reeves (1972), Driver (1978: 166) identified a settlement pattern that consists of winter valley bottom camps when bison were the main ungulates hunted, with deer and sheep as subsidiary, while in summer, groups moved to higher elevations where bison were still the dominant ungulate hunted but other species were also important. In this pattern, precontact human settlement was concentrated along the main pass while subsidiary occupation took place in creek valleys with the greatest areas of microtopographic/microclimatic grasslands (ibid.: 138).

Evidence from the Elk drainage itself consists at present of a few stemmed and leaf-shaped projectile points and more frequent large generally retouched flake tools derived from bifacial cores. These suggest the transitory presence of human hunters during early Holocene time.

The pollen data suggests that the influence of the Maritime westerlies on the palaeoenvironment of the upper Columbia Basin increased markedly after 8000 cal BP, resulting in the development of large rain shadows on the east sides of the mountain crests (Choquette 1987a). The strong influence of warm westerly winds (the "Chinook" effect) apparently supported the highest bison carrying capacity and correlatively high human population densities in the Rocky Mountain foothills during this same time period (ibid.). While archaeological data from the Elk River drainage itself during this time period is sparse, the available regional evidence indicates considerable travel through it between the Rocky Mountain Trench and the Crowsnest Pass.

After 6000 years ago, the cool-moist trend represented by the onset of Neoglaciation resulted in the upland orientation of the human population to the Rocky Mountains giving way to a more intensive focus on local valley bottom resources. Human occupation of the northern part of the East Slope of the Rockies appears to have declined and became more focused on rain shadow grasslands; inhabitation of the Crowsnest Pass vicinity continued. The scarcity of archaeological sites dating to this period in the Elk Valley proper continues, suggesting that it was not occupied year-round. However, in the tributary valleys immediately west of the Continental Divide, a number of sites have been recorded on saddles and at the junctions of fourth and fifth order valleys. The ages of most of these montane sites are still unknown but a component at a hunting camp on Henretta Creek was dated to ca. 3900 cal BP (Wood and Choquette 2006), a tested rock shelter on the west side of Racehorse Pass yielded a date of ca. 3200 cal BP (Brulotte 1983) and an "Oxbow" projectile point of Banff siliceous siltstone surface collected at Ewin Pass (Choquette 1979) is stylistically diagnostic of an age range of 6300 – 3200 calendar years ago. These age estimates and the lithic materials represented in the sites support the hypothesis that the archaeological assemblages along the west side of the Continental Divide represent evidence of hunting by groups resident east of the Continental Divide during the early Neoglacial Period. This model of early Neoglacial human utilization of the terrain and resources in the middle Elk River drainage overlaps with and expands upon Driver's "Herd Hunter" model described above.

The regional climate changed significantly after 2500 years ago, when increased Continentality resulted in a significant reduction in precipitation and fluvial discharge. In the middle Elk River drainage area, vegetal responses included expansion in the size of the grassland "tiles" in the upland vegetal mosaic and the emergence of extensive grasslands on the level, gravel-cored terraces flanking the Elk River and the lower parts of its major tributaries, which previously had been parts of considerably larger alluvial floodplains. Increases in ungulate range accompanied the enlargement of forest openings and the rejuvenation of fire succession open canopy forests. The expansion of bison into the enlarged natural grasslands in the Elk Valley at this time was accompanied by a significant increase in human activity reflecting the establishment of a semi-permanent human population with a pattern of systematic exploitation of the biological and geological resources of the middle Elk watershed area itself. Habitation, fishing and hunting of resident bison on the enlarged grasslands west of the Continental Divide were apparently significant components of the late Holocene human land/resource use model that is identified ethnographically by Schaeffer (n.d.) as the Gakawakam:tuk:n:k, or Michel Prairie Band.

3.2.2 Rocky Mountain Trench

3.2.2.1 Previous Archaeological Investigations

Archaeological investigation in the part of the Rocky Mountain Trench containing the Cranbrook-Kimberley-Skookumchuck laterals has been sporadic, beginning with a number of brief inventory-oriented reconnaissances carried out during larger-scale archaeological surveys in the East

Kootenay area (Choquette 1971, 1974; Keddie 1971, Rousseau and Richards 1980). While the TransCanada (formerly Alberta Natural) Gas pipeline was surveyed in 1975 (Reeves and Head 1976), only one part of the Cranbrook Laterals / Loops has ever been the subject of any archaeological investigation (Bedard 1992) and none of the laterals / loops have ever been the subject of a systematic archaeological survey.

An inventory survey of the City of Cranbrook was begun in 1977 and expanded in 1990 (Choquette 1977, 1991). Other studies in the immediate vicinity of the Cranbrook-Kimberley-Skookumchuck laterals / loops have been oriented towards impact assessment of various land developments and infrastructure upgrades (Choquette 1976, 1992, 2006a, 2007; Choquette and Mitchell 2008; Wood 2008; Tamasi 2011; 2017; Golder Associates 2016, 2017; Neil and Tamasi 2017).

Archaeological assessments conducted in advance of proposed logging in the project area include overviews (AOAs) of Provincial Forest Landscape Units C11, C30, C32 and I03 (Choquette 1997b, 1999a and b, 2000) and forestry impact assessments have been carried out in the immediate vicinity, none of which have resulted in the recording of any precontact sites.

3.2.2.2 Culture History

These disparate archaeological investigations have not produced a cultural chronology for the Cranbrook-Kimberley-Skookumchuck laterals / loops study area, but a series of models developed for the southern Rocky Mountain Trench can be applied as a framework for site significance assessment and sampling strategy development. The information deriving from the relevant archaeological investigations has been synthesized into a number of archaeological complexes which comprise constellations of the following attributes: settlement pattern (represented by landform, palaeohydrology, soil/sediment association(s), and geographic catchment demonstrated by the spatial distribution of distinctive lithic types); technology; subsistence base; features / activity areas; and tool function / morphology. These hypothetical models are amenable to testing via controlled archaeological data recovery.

The earliest archaeological remains in the vicinity are those of the Goatfell Complex, centred on the southwestern Purcell Mountains immediately to the west. Associated with this complex are a series of tourmalinite workshops and campsites situated on well-drained glaciolacustrine, glaciofluvial and aeolian landforms associated with the later stages of proglacial lakes. These sites contain evidence of a distinctive stone tool technology which produced large unifaces, large stemmed weakly shouldered and lanceolate spear points and a variety of large marginally retouched flake tools from easily portable cores that themselves served as chopping and scraping tools. An age of ca. 12,000 + 1000 cal BP has been postulated for the inception of the Goatfell Complex land and resource use pattern in the upper Columbia River drainage area on the basis of geo- and tephrochronology, palynology and typological cross-dating of artifacts. Microcrystalline stone, especially tourmalinite, quartzite and metasiltite, was prospected for, mined and manufactured; the find of a large stemmed spearpoint at the North Star Mountain tourmalinite quarry just west of Kimberley indicates the presence of the Goatfell Complex in the project area vicinity, but little further specifics can be provided due to the paucity of the present data. It is hypothesized that the seasonal round in the southern Purcells comprised winter encampment adjacent to proglacial and early postglacial lakes, summer quarrying and hunting in the adjacent mountains, and relatively rapid spring and fall transhumance between these two major foci. Cultural ties are apparent with the early cultures of the east slope of the Rocky Mountains (Fedje et al 1995) and especially with the Great Basin at this early time level. It is presently speculated (Choquette 1996) that the Goatfell Complex represents a human culture adapted to the mountain lake steppe environment present in western North America during late

Pleistocene time. This habitat, people included, shifted northward as the climate warmed, lakes in the Great Basin drying up while new lakes formed in the Columbia and Rocky Mountains as the glaciers receded.

After this time, evolution of the landscape as local hydrological baselines lowered and changes in ecology related to the development of the vegetal mosaic are represented by changes in settlement pattern. The archaeological assemblages from these settings display a continued focus on microcrystalline stone utilizing the biface core and large expanding flake-based technology but cobble clasts were more commonly used as tool stock, reflecting the greater availability of gravel sources exposed by erosion of the glacial drift valley fills as the levels of the large early lakes and watercourses declined. The projectile points are slightly smaller (6-8 cm long) lanceolate forms, a style strongly resembling the Agate Basin type being especially common. In the southern Purcell Trench, components associated with fluvial bars, relict channels and elevated remnant floodplains graded to the earliest stages of the postglacial riverine regimes are provisionally named the Saugum Complex after a site on an elevated remnant of an early Kootenay River floodplain about 6 km east of the Skookumchuck Lateral, and a number of other sites of this complex also occur in the immediate vicinity, for example DjPw-4 adjacent to the Cranbrook-Kimberley lateral. During the droughty fire-prone Hypsithermal/Altithermal interval between ca. 11,500 - 9,000 cal BP, the steppe-tundra evolved into xeric savannah under the predominance of meridional circulation and continental climate conditions of increasing warmth and drought as solar insolation increased (Choquette 1987a). Fire climax savannah, open canopy forests and high elevation grasslands, all with high ungulate capability, covered a wide expanse of mountains and valleys in the upper Columbia River drainage. The reduction in projectile point size may represent the adoption of the spearthrower, reflecting different hunting methods that were themselves adaptations to the evolution of early Holocene ecosystems.

The end of the Saugum Complex corresponds with increasing Maritime influence and probably reduced ungulate capability in the southern Cordillera after about 8000 years ago. However, due to the influence of warm westerly Chinook winds, the bison carrying capacity of the East Slope of the Rocky Mountains may have been at its peak between. 8000 and 6000 years ago (Choquette 1987a). The well represented archaeological record from this area suggests that the highest human population densities of the entire Precontact period occurred during this time. These may have included an intrusive population, the Mummy Cave Complex, who brought with them large side-notched projectile points (Reeves 1973). The intensity of human occupation apparently increased in the southeastern Purcells and the southern Rocky Mountain Trench during this time as well, where two separate human groups are apparent. South of the present study area, an archaeological complex named Bristow has been defined for the period ca. 8000 BP to 6000 BP. The settlement pattern of the Bristow Complex displays a high terrace orientation; additional significant continuities from earlier times include preference for microcrystalline stone, the biface core technology, high frequency of unifacial flake-based tools and infrequent fire-broken rock. The focus on stone from gravel sources is a significant defining characteristic. Notching as a hafting technology makes its appearance at this time, and large side/corner- and side-notched dart points are characteristic of Bristow Complex assemblages.

The geographic focus of human occupation on the southeastern Purcells and the southern Rocky Mountain Trench may have been an adaptive response of resident humans to the climate change during this time period that resulted in the development of the rain shadow east of the Purcell Mountain crest. This phenomenon is manifest in the Cranbrook vicinity, which is situated only about 5 km from the Purcell Mountain divide with the Moyie drainage. The intensity of human inhabitation increases over time around Joseph's Prairie in the pronounced rain shadow downwind of this divide. It is thus apparent that humans were present during this time period in

the study area itself, albeit represented by an as yet not formally defined archaeological complex. They quarried a unique variety of tourmaline chert in the eastern Purcells above the St. Mary River and also utilized the Top of the World Chert quarries in the Rockies to the east. The distinctive east-west patterns of distribution of these lithic materials may also encompass the East Slope of the Rockies, specifically the Crowsnest Pass, as noted above. Large side-notched dart points and a distinctive block core biface technology (Choquette 2012) are also characteristic of this emerging early mid-Holocene archaeological complex.

With the onset of Neoglaciation, the climate became notably cooler after 6000 BP. Evidence from throughout the region of much larger alluvial floodplains and higher lake levels suggests heavy snowfall during early Neoglacial times (ca. 6000 - 2500 b.p.). While deer bone typically dominates the faunal assemblages of archaeological sites dating to this time interval, there is also evidence indicating that fishing, plant gathering and the hunting of waterfowl and aquatic animals had also become important. The upland orientation of the resident humans gave way to a more intensive focus on the resources of the valley bottoms. Fire-broken rock is much more common than previously, often occurring as concentrations, reflecting the development of new techniques for processing the increased diversity in subsistence base. Two archaeological complexes are presently recognized in the southern Rocky Mountain Trench during this time, which likely represent discrete band subsistence rounds. The lithic technology of both is similar to the previous complexes in being dominated by manufacture of bifaces by percussion, the expanding flakes so produced then utilized outright or marginally retouched into tools. However, the technological focus had shifted away from biface cores and tools are smaller compared to the products of the previous strategies. Large side- and side/corner notched points are still present, including those strongly resembling the “Oxbow” style, and stemmed points are common in the cultural deposits of this time period. The Kikomun Complex encompasses assemblages of siliceous mudstone pebble-based artifacts on terraces and fans in the northern Tobacco Plains while in the present study area vicinity, the Kettle Lake Complex has been defined on the basis of tourmalinite-dominated assemblages in small campsites on terraces above the present-day shores of the numerous kettle lakes that dot the floor of the Rocky Mountain Trench, including in the immediate vicinity of several of the Cranbrook laterals/loops. More intensive winter encampment appears to have been along the Kootenay River in the rain shadow of Mount Baker.

During the last 2500 years, some significant but gradual shifts in settlement pattern, subsistence base, technology and lithic material use are apparent in the archaeological record of the upper Columbia River drainage area. In the southern Rocky Mountain Trench, these changes reflect both further resource intensification and economic reorientation towards apparently increased ungulate populations. Numerous large, intensively inhabited sites on alluvial floodplain terraces dating to this time contain dense middens of fire-broken rock and bone. Smaller upland transitory encampments on higher erosional terraces are also represented. Deer continued to be important but representation of herd grazers such as elk, sheep and bison increases in the bone samples of the last two millennia. Most of the projectile points in use during this time period are large and small corner-notched and small side-notched forms. Technological developments during this 2500 year period include adoption of the bow and arrow, an increase in high angle and bipolar block core reduction to produce small scrapers, gravers, wedges and arrow points from well-controlled lamellar and rectangular flakes, and a significant decrease in tool size that probably reflects much greater reliance on hafted tools as opposed to merely hand-held stone blades. There was also a highly significant shift in lithic material use during this time. Cryptocrystalline stone became the preferred tool stock and chert from Top of the World in the Canadian Rockies predominates throughout the southern Rocky Mountain Trench. Data from the Cranbrook vicinity is accumulating to suggest that a distinct social group may have been present in the Kootenay - St. Mary – Bull River confluence locality, making many of their tools of tourmaline chert and having

a subsistence focus on the grasslands and associated ungulate populations of this part of the Rocky Mountain Trench. The human group represented by this archaeological manifestation is probably that referred to as the extinct "Fort Steele band" by Turney-High (1941: 19-20).

The precontact period ends with a series of developments beginning in the Seventeenth Century that had profound and not well documented effects on the lifeways of the local aboriginal population. Most of these developments were the result of the arrival of Europeans. One of the most drastic is also the least well known: the effect of epidemic diseases such as smallpox, which likely reduced the native population by 80% or more before Europeans even arrived in the region. The Nineteenth Century witnessed the invasion of Ktunaxa traditional territory by successive waves of fur traders, missionaries and prospectors. The Ktunaxa became adept fur trappers and learned the arts of agriculture, operating a number of successful farms before escalation of the inevitable conflicts with American prospectors who swarmed over the region searching for gold. The St. Mary's Reserve (Kootenay Indian Reserve No. 1) was created on the St. Mary River beside the St. Eugene Mission, established in 1874 by the order of Missionary Oblates of Mary Immaculate. With the infusion of capital from the sale of mining claims near Moyie, the St. Eugene Mission became a large self-supporting complex. In 1912, the Federal Government constructed a large residential school which is now part of a hotel - golf course recreational complex.

3.2.3 Lower Kootenay / Columbia

3.2.3.1 Previous Archaeological Investigations

Despite including the confluence area of two of the continent's major rivers, the area traversed by the Castlegar-Nelson lateral has never been the subject of a systematic archaeological inventory. The closest approach was Turnbull's inclusion of the locality in his doctoral research that focused on pithouses on the Arrow Lakes. All 4 sites investigated by Turnbull in the lower Kootenay Valley were at lower elevations. One of these, DiQi-5, is on two lower terraces about 100 m southeast of the Castlegar-Nelson lateral. Turnbull's excavations at this site defined three components dating back as far as 2200 calendar years ago. This site was subsequently shovel tested as part of an Archaeological Impact Assessment (AIA) of the then-proposed Terasen aerial gas line upgrade project on part of the pipeline that is the subject of the present AOA) (Rogers 2011). Rogers also speculates that "a pithouse and cache pit feature" at a second site, DiQi-2, may have been "filled in or destroyed during the previous installation of the north-south trending natural gas line" (ibid.: 190).

Several other spatial surveys have included parts of the Trail-Castlegar-Nelson laterals project area. Those of relevance are the 1972 judgmental archaeological survey of the Nelson area associated with excavation at DiQi-1 (French 1973), the survey of Castlegar and vicinity (Choquette 1977), and the AIA of the then-proposed Murphy Creek Hydroelectric Project (Baker 1982). These studies recorded 6 sites (DhQj-5, 7, 9, 14, 22 and 23) within 100 m of the Castlegar-Nelson lateral. One of these (DhQj-14) is transected by the lateral on a high terrace and relict fluvial bar at 520 m. Early Holocene artifacts collected from disturbed and deflated stratified sands included lanceolate and stemmed/foliate projectile points, and keeled microblade cores and blades (Choquette 1977, 1996). Much of this site was subsequently destroyed by unmitigated gravel pit expansion associated with nearby highway construction projects. The existing right of way appears to form the south boundary of DhQj-5, an intermediate (ca. 440 m) sandy terrace from which at least one burial has eroded. An AIA of a park development (Taylor 2013) resulted in the recording of DhQj-38, just over 30 m from the Castlegar-Nelson lateral.

AOAs associated with forestry operations on Crown land traversed by the laterals were carried out of Landscape Units K10, K11and K12 (Choquette 2006b) and in the Arrow Forest District by Kutenai West (Handley et al 2000).

3.2.3.2 Culture History

The lack of systematic archaeological investigation is manifest in the lack of a precontact cultural chronology for the Lower Kootenay/Columbia locality, again necessitating extrapolation from adjacent areas.

Evidence of human presence has been found on some of the earliest postglacial landforms in the West Kootenay area, including high delta-terraces, spillways, beaches, and dunes associated with stands of proglacial lakes including the 595 m stand of Glacial Lake Columbia. Archaeological remains from upland and high terrace contexts above Kootenay, Duncan, Arrow and Whatshan lakes (Choquette 1996, Tamasi and Choquette 2015) indicates that humans were resident there some 12,000 or more years ago, pursuing a long-standing pattern of occupation that included subsistence based on both hunting and anadromous salmon, use of watercraft, and a distinctive lithic technology that evolved from upland quarrying to increased exploitation of cobble sources as they became exposed by the falling lake levels. In addition to their early landform and sediment associations, these archaeological components share a number of common characteristics with the Goatfell Complex, named for the predominance of tourmalinite and tourmaline chert from Goatfell Quarry in the southern Purcell Mountains. The stone technology is primarily based on the production by percussion of large expanding flake blanks from large bifacial cores, edges of which were prepared by grinding. Large discoidal unifaces, large side scrapers, large stemmed weakly shouldered and lanceolate spearpoints and a variety of large marginally retouched flake tools are typical. The distribution of this stone in archaeological sites southward to Lake Pend Oreille and westward into the Purcell Trench, and the occurrence in Goatfell Complex components of Kootenay Argillite from a quarry above the North Arm of Kootenay Lake, indicate that the Purcell Trench was a significant part of the area utilized by Goatfell Complex people who likely ranged into the Trail- Castlegar-Nelson project area as well. Cultural ties are apparent with the early Stemmed Point cultures of the Great Basin and the east slope of the Rocky Mountains.

Subsequently, changes in some characteristics of the settlement pattern and site environs parallel developments in ecological and landscape evolution as local hydrological baselines lowered and the vegetal mosaic fluctuated in early postglacial time. This has prompted the definition of the Gallop Creek Complex to encompass archaeological components associated with the higher stands of Kootenay and Duncan Lakes; related components in the southern Purcells are associated with landforms such as relict fluvial bars and elevated braided floodplain terraces related to the earliest stages of the riverine regimes. The archaeological assemblages from these settings display a continued focus on microcrystalline stone utilizing the biface core and large expanding flake-based technology, but cobble clasts were more commonly used as tool stock, perhaps reflecting the greater availability of gravel as the levels of the extensive early lakes declined. The projectile points are slightly smaller (6-8 cm long) stemmed and lanceolate forms, and a style strongly resembling the Agate Basin type is especially common. The wide spatial distribution of this form suggests that the southern Rocky and Columbia mountains were rather intensively occupied by human during the early Holocene. Evidence of use of watercraft and possibly salmon fishing are postulated. The reduction in projectile point size may represent the adoption of the spearthrower, reflecting different hunting methods that were themselves adaptations to the evolution of early Holocene ecosystems as the early Holocene continental climate became increasingly warm and dry under the predominance of meridional circulation, and the steppe-tundra evolved into xeric savannah in much of the upper Columbia River drainage (Choquette 1987a).

There is some evidence to indicate that a separate, less well defined and more localized archaeological complex, first identified at Kettle Falls, may be represented in the Trail-Castlegar-Nelson project area that exhibits a riverine focus associated with downcutting of the Columbia River through the glaciolacustrine valley fill. The settings of sites, preference for different types of stone for tool manufacture, leaf-shaped projectile points, and the distinctive microblade technology distinguish these assemblages and suggest the presence of a cultural group distinctive from the Goatfell / Gallop Creek people. Microblades are present in some of the early assemblages at the uppermost falls on the lower Kootenay River (French1973) and, as noted previously, at DhQj-14 on a high fluvial terrace above the Kootenay – Columbia confluence (Choquette 1996); leaf shaped points are associated with the aforementioned fluvial terrace and with fluvial bar sediments on another, lower such landform south of the Castlegar Airport (Choquette 2003c) indicating that these people were also in the immediate vicinity of the present study area in early to mid-Holocene time.

As noted in Section 2.3 above, climate change after 8000 years ago involved increasing maritime influence with greater influence of storm tracks and rain shadows on the vegetal mosaic and animal populations adapted to it. West of the Purcell Mountains, the cooler and moister conditions supported the development of more diverse forest communities but declines in ungulate capability. However, there is minimal information regarding human use of the southern Columbia Mountains: the evidence is limited to the aforementioned assemblages and some surface finds of large side-notched and side/corner-notched similar to those dated to between about 8000 and 5000 years ago in adjacent regions. It is not known whether this relative paucity of data reflects lower human population density or if it is the product of sampling bias, in that the focus of most archaeological investigation has been on pithouse sites beside modern lakes and rivers, and few sampling strategies have been characterized by an awareness of higher previous local hydrological baselines.

With regard to the later Holocene West Kootenay culture history, the cultural chronology is most commonly lumped into the “Plateau” culture area, where the archaeological record is conceived of as a linear sequence of cultural-temporal units based on artifact and feature characteristics. Two “traditions" (Nesikep, dating 7000 - 4500 years before present and Plateau Pithouse, ca. 4500 - 200 BP) have been defined in the Fraser-Thompson drainage (Rousseau 2004) while four "Archaic periods" have been proposed for the Columbia Plateau to the south: Palaeo (pre-11,000 - 8000 BP), Early (8000 - 5000 BP), Middle (5000 -2000 BP) and Late (2000 BP - AD 1720) (Andrefsky 2004). At the local level, these broad temporal units are subjectively divided into sequences of “phases” according to representation of so-called diagnostic artifacts. Following this approach, the archaeological record of the present study area was initially subdivided into four phases based on very limited excavations (Eldridge 1984 based on Mohs 1981 and Turnbull 1977). For the Selkirk Trench / Lower Kootenay River locality, this is limited to the Deer Park Phase (Turnbull 1977); dating between 3800 and 2600 cal BP, defined primarily by occupations of pithouses, and focused on the south end of Lower Arrow Lake. Although Turnbull encountered evidence of more recent inhabitation, it was not sufficient to support the definition of a culture historical unit equivalent to the Deer Park Phase. However, Eldridge utilized data from the Vallican Site in the Slocan Valley to define three more phases: Winlaw (3500-2450 BP), Vallican (2450-1250 BP) and Slocan (1250 BP – contact). These were all later subsumed into another linear sequence based largely on data from the Pend d'Oreille River Valley in northeastern Washington (Goodale et al 2004) and from pithouses in the Slocan Valley (Goodale et al 2009). Adding cultural depressions and certain other feature types, the phases were reclassified based on Binford’s (1980) cultural typology as "adaptive patterns": Forager (6200 - 4200 BP) and Collector I, II and III (3799 - 2000, 1999 - 600 and 599 - 100 BP, respectively).

As in the more easterly parts of the Set 3 project area, the arrival of Europeans around AD 1800 severely reduced the vitality of all of the aboriginal cultures when their populations were decimated by epidemic diseases such as smallpox and tuberculosis. The surviving Lower Ktunaxa were settled on reserves near present-day Creston, B.C., the remnants of the Arrow Lakes Band scattered to various Okanagan, Ktunaxa and Secwepemc groups and the Sinixt settled predominantly on the Colville Reservation in Washington due to the imposition of the International Boundary on their traditional territory.

4 Methods

This project was carried out in several phases: review of relevant background information; synthesis of data / model development; air photo analysis and digital mapping; preliminary field reconnaissance; and preparation of the present report. Methods are described in more detail below.

4.1 Desktop Archaeological Potential Assessment

4.1.1 Background Review and Synthesis

Background data assembly for the desktop assessment began immediately after project kickoff. Information was gathered on previous investigations and recorded sites within 100 m of the project laterals. This process had already been completed before the 30 m buffer convention was established and this information is incorporated into the descriptions of the various laterals/loops. After the shapefiles of the appurtenances were downloaded into the GIS and the specific locations analyzed in more detail, it was possible to define the relationships between archaeological units and pipeline components more specifically and the 30 m buffer was employed to improve the precision of the analysis and assessments.

The main sources of information were the Kootenay Heritage Centre library, archives and GIS, and the internet including the provincial archaeological site registry accessible via the BC Remote Access to Archaeological Data (RAAD) application and the Provincial Ministry Library of archaeological reports.

4.1.2 Analysis and Mapping of Archaeological Potential

All available relevant information was overlaid as GIS layers. This included TRIM layers, biogeographic and bedrock geology mapping, existing archaeological potential polygons and, where available, more detailed contour mapping (ranging from 5 to 20 foot intervals) in the form of the 1951 Government of Canada Mines and Technical Surveys Columbia River Basin topographic maps. This analysis was supported where needed by use of stereoscopic and oblique air photo and satellite imagery.

None of the individual pipeline laterals and loops that are the focus of this desktop assessment have ever been the subject of any kind of systematic archaeological investigation. However, portions of their routes traverse areas that have been subject to archaeological potential mapping via AOAs of proposed forestry developments. This mapping has followed two separate and distinct methodologies. Landscape Units in the Cranbrook, Invermere and parts of the Kootenay Lake Forest Districts were mapped using a landscape/landform-based approach (Choquette 1996-2009). The existing archaeological record was synthesized into predictive models of precontact human land and resource use that informed stereoscopic air photo analysis to identify

and assess discrete, archaeologically meaningful terrain units. These are delineated as GIS polygons that have associated databases containing the criteria employed to score relative archaeological potential and define the locations, sizes and shapes of the polygons.

Parts of the Kootenay Lake Forest District were subject to AOA mapping by Kutenai West Heritage Consultants (KWHC n.d.), who assigned values to pre-existing GIS layers and grouped them according to subjective criteria of potential archaeological relevance. Along with attributes of slope derived from the TRIM DEM, cutoff values in the overlaps of layer scores were delineated with 20 m square polygons, with linear buffers to TRIM-based water features. While the intended use of this mapping is for overview purposes, there are several serious constraints on its use as a tool for assessment of archaeological potential, impact and significance and for generating recommendations on the need for further investigation. The selection, definition and scoring of the attributes was subjective and uninformed; for example, TRIM and BEC data comprise the foundation for polygon delineation but only pertain to short and recent spans of time, rendering them essentially irrelevant prior to the significant mid-Holocene climate change, by which time there is abundant evidence that the region had already been inhabited for an even greater duration. The model layers thus have minimal utility for predicting archaeological site locations earlier than about 6000 years ago. Another limitation in the KWHC mapping is related to the scale of units of capture. Most of the subjectively selected biogeographic attributes express at very coarse scale. More crucial is the bias against the reliability of the attributes based on the DEM due to the statistical incongruence of its precision [+ 10 m] compared to the size of the mapped quadrats (20 X 20 m), introducing in a margin of error that equals the analytic and display unit. The cumulative contributing of these constraints is that the specific locations of the individual quadrat boundaries are unreliable. However, where there is high adjacency, the overlap with greater numbers of quadrats can be extrapolated at a wider range of horizontal overlap. With regard to the apparent weighting of slope especially, the KWHC mapping is useful for identifying potentially significant expanses of level terrain that is captured by geographic clusters of adjoining quadrats. Given the abundance and size of terraces crossed by the West Kootenay laterals, this mapping was generally employed in the present study as an indicator of DEM-delimited slope to provide additional spatial perspective to that revealed by the TRIM contours. The other digital spatial attribute, the water buffer, is dependent upon the historic locations of water features and does not capture palaeohydrology. As a result of these constraints, there is a high noise level of scattered individual archaeological potential quadrats the validity of which is statistically unreliable and at the other end of the spectrum, significant amounts of terrain having archaeological potential are not captured by the KWHC mapping.

Survey coverage is an additional consideration. A significant proportion of the land traversed by the Fortis laterals/loops in the East Kootenay is under jurisdiction other than forestry-related and has not yet been mapped for archaeological potential at all.

Considering the above circumstances, the archaeological potential of at least half of the extent of the Set 3 laterals/loops had not been assessed. In order to do so for the proposed Fortis Inland Upgrades construction zones, it was necessary to conduct a significant amount of additional archaeological potential mapping. This was accomplished via adaptation of the methodology previously employed for the AOA mapping of the surrounding Cranbrook, Invermere and Kootenay Lake Forest District Landscape Units. A change in symbology for expressing archaeological values is one of the most significant adaptations: polygons have been replaced by vectors which better represent a linear development. This study employed 60 m wide vectors centered on the digitized locations of subject laterals and loops. Changes were also made in the consideration and emphasis given to the various predictive attributes. The localized positioning and small area of these laterals/loops relative to the much larger size of a watershed-based

Landscape Unit renders most of the Macrosite Criteria used for the LU mapping redundant at the scale of the present AOA. Corridor, Ungulate Range and Solar Aspect (Choquette 1996-2009) are of scales too inclusive for differentiation within this analysis. On the other hand, the Known Sites attribute benefits from the scale, however, to the extent that it is promoted to polygon status which can be taken to represent Confirmed Archaeological Potential. Besides the relative precision of overlap representation with regard to impact assessment, the Known Sites attribute is differentiated in being subject to a different rate of temporal change than the other attributes typically employed in prediction of archaeological potential. In quantitative terms it is subject, at least at present, by a growing site inventory while the site spatial dimensions themselves also change over very short periods of time. This is of particular relevance with regard to revision of site boundaries subsequent to the original recordings. One final adaptation is the condensation of the Microsite Criteria of the LU polygon data bases into two archaeologically relevant biogeographic attributes directly applicable to the terrain traversed by the subject pipelines: Landform and Hydrology provide representation of the temporal and palaeoecological dimensions.

Analysis of traverses of the various laterals and loops across the GIS landscape resulted in the identification of areas previously assessed as having archaeological potential as well as additional such areas where AOA mapping had not previously been undertaken, and filling in the gaps utilizing the adapted methodology just described. Consistent with the previous discussion, pre-existing archaeological site and LU polygons were retained, while traverses of the project area across land identified as having archaeological potential in this study were delineated by coded vectors. After the specific locations of the appurtenances were downloaded, those overlapping or within about 30 m of the given lateral/loop were delineated by polygons, or in some instances by points, codified by assessment and recommendation, and tabulated for each lateral as presented below.

A note on the archaeological unit numbering in the maps and tables is in order here. The precontact archaeological site locations are delineated as GIS polygons downloaded from the Provincial Registry as accessed via the RAAD (Remote Access to Archaeological Data) application. Such sites are numbered sequentially within geographical quadrants designated by a hierarchical alphabetical code (the Borden System [Borden 1952]). Thus DiPw-5 is the fifth site recorded in quadrant DiPw. With regard to archaeological potential, the differences in analytic mapping methods as described above resulted in differing approaches to the landscape that also influenced the mapping vehicles. Thus Landscape Units are typically modern watersheds, within which archaeological potential was identified via digital polygons capturing landforms. The mapping of Landscape Units proceeded according to administrative/logistic priorities (i.e. contract schedules and available air photos) over many years. As an example, the mapping of LU C11 started at its northwest end and followed air photo flight lines southeastward, polygon numbers increasing in that general direction.

In contrast, the present project area is by definition a linear traverse across sections of watersheds. Overlapping appurtenances were numbered in sequence along the length of the given lateral / loop and a differentiation was made as to whether the Recommendation was for Preliminary Field Reconnaissance or for Archaeological Impact Assessment. The rationale for differentiation between these two types of assessments was generally based on the extent of previous investigation, amount of available information regarding stratigraphy, and the severity of potential disturbance; additional detail is presented for each routing in the PFR report previously submitted (Stantec 2018). While there is sufficient information on a few areas such that a recommendation for an Archaeological Impact Assessment (AIA) was made, the great majority of overlaps between assessment units indicating archaeological potential and the locations of

proposed construction lacked sufficient information for a confident determination that an AIA would be required. Therefore, these areas were recommended for confirmation/ground truthing via PFR in order to obtain sufficient information for confidence to be placed in recommendations for AIA and the cost estimates derived therefrom.

4.2 Preliminary Field Reconnaissance

The assessment of the need for Preliminary Field Reconnaissance in support of Level 3 and 4 cost estimates for Archaeological Impact Assessments was based on analysis of the background data summarized in Sections 2 and 3 of this report. In the field, the requirement for information regarding the ground truthing of archaeological potential was combined with an assessment of disturbance and recorded for each PFR target.

Survey of the identified PFR areas was conducted using field maps with each PFR location plotted on the ROW for each Lateral and Loop. Access was gained via truck or walking/hiking. Where access was not possible, the target area was visually surveyed from a distance; if visual survey was not possible the area was recommended for AIA. Pedestrian survey of each location included assessment of any subsurface exposures, tree throws, cut banks, etc., and a description of soils if/where possible. Disturbance was noted, photographed, and described. Survey also included visual inspection for exposed artifacts, fire broken rock and cultural features. Photos were taken at all PFR locales documenting High Archaeological Potential areas / landforms, as well as exposed sediment profiles where possible, and existing disturbance outside of the road and ROW footprints. GPS units were used for tracking survey coverage along the gas line ROW and into areas of potential, e.g. into the interior of a terrace, knoll or bench through which the ROW runs. Notes were also taken, where necessary, regarding routes of access to target areas, names/info of landowners, etc.

5 Results

5.1 Background Information Review

5.1.1 Set 3

Results of the background information review have been synthesized in Sections 2 and 3 above.

A search of the provincial registry yielded a total of 59 precontact archaeological sites in proximity to the various Set 3 laterals and loops; these are summarized in Table 1 below and in Stantec (2018).

LATERAL / LOOP	SITE NUMBER	SITE TYPE	SIZE (m)	LOCATION
Castlegar – Nelson 168	DhQj-5	Cultural Material, Surface; Precontact, Human Remains, Burial	600 x 50	ROW is presently recorded as south site boundary
	DhQj-9	Cultural Material, Surface, Lithics; Cultural Material, Surface, Firebroken Rock	50 x 20	110 m E of ROW
	DhQj-14	Cultural Material, Surface, Lithics	2500 x 200	ROW passes through site
	DhQj-22	Precontact, Human Remains, burial; Habitation Feature, Cultural Depression, Housepit	90 x 50	150 m SE of ROW

LATERAL / LOOP	SITE NUMBER	SITE TYPE	SIZE (m)	LOCATION
		Subsistence Feature, Cultural Depression, Cache Pit"		
	DhQj-23	Precontact, Other Feature, Cultural Depression, Function Unassigned	unknown	150 m SE of ROW
	DhQj-38	Cultural Material, Surface, Lithics	10 x 10	25 m SE of ROW
	DiQj-2	Cultural Material, Surface ,lithics; Subsistence Feature, Cultural Depression, Cache Pit; Habitation Feature, Cultural Depression, Housepit"	370 X 80	280 m N of ROW
	DiQj-5	Subsistence Feature, Cultural Depression, Cache Pit; Habitation Feature, Cultural Depression, Housepit"	150 x 50	100 m SE of ROW
	DiQj-25	Cultural Material, Surface, Lithics	50 x 50	100 m SE of ROW
Cranbrook 168	DiPw-2	Cultural Material, Subsurface Lithics, Firebroken Rock; Cultural Material, Surface Firebroken Rock	215 x 40	80 m S of ROW
	DiPw-3	Cultural Material, Subsurface, Lithics	300 x 200	140 m E of ROW
	DiPw-4	Cultural Material, Surface Lithics, Firebroken Rock	95 x 30	300 m E of ROW
	DiPw-5	Cultural Material, Subsurface, Lithics, Faunal, Firebroken Rock; surface lithics, Firebroken Rock	260 x 95	145 m E of ROW
	DjPw-3	Cultural Material, Subsurface, Lithics	80 x 35	300 m S of ROW
	DjPw-4	Cultural Material, Surface, Lithics, Faunal, Firebroken Rock	120 x 60	Adjacent to ROW on NW
	DjPw-8	Cultural Material, Subsurface, Lithics	170 x 80	210 m E of ROW
	DjPw-20	Cultural Material, Surface, Lithics	unknown	Adjacent to ROW on W
	DjPw-21	Cultural Material, Surface, Lithics	48 X 40	Adjacent to ROW on SW
	DjPw-36	Cultural Material, Surface, Lithics	200 X 40	ROW passes through site
	DjPw-37	Cultural Material, Surface, Lithics	220 X 80	ROW passes through site
	DjPw-38	Cultural Material, Surface, Lithics	10 X 10	40 m N of ROW
	DjPw-47	Cultural Material, Subsurface, Firebroken Rock; Surface Firebroken Rock	20 X 20	125 m S of ROW
Kimberley 168	DjPx-10	Cultural Material, Surface, Lithics	125 X 35	120 m N of ROW
	DjPx-11	Cultural Material, Surface, Lithics	unknown	200 m N of ROW
Skookumchuck 219	DkPw-38	Cultural Material, Surface, Lithics	100 X 50	100 m E of ROW
	DkPw-67	Cultural Material, Surface, Lithics	150 X 15	ROW passes through site
Elkview 168	DkPr-5	Cultural Material, Surface, Lithics	unknown	75 m S of ROW
Fording 168 & 219	DjPq-38	Cultural Material, Surface, Lithics	70 X 35	70 m E of ROW
	DkPr-1	Cultural Material, Surface, Lithics	8 x 5	400 m W of ROW
	DkPr-2	Cultural Material, Subsurface, Faunal	10 x 10	190 m W of ROW
	DkPr-3	Cultural Material, Surface, Lithics	20 x 20	325 m W of ROW

LATERAL / LOOP	SITE NUMBER	SITE TYPE	SIZE (m)	LOCATION
	DkPr-4	Cultural Material, Subsurface, Lithics	600 x 100	Adjacent to ROW (plotted wrong on RAAD)
	DkPr-5	Cultural Material, Surface, Lithics	unknown	Adjacent to ROW (plotted wrong on RAAD)
	DkPr-6	Cultural Material, Surface, Lithics	800 x 60	500 m SW of ROW
	DkPr-8	Cultural Material, Surface, Lithics	130 x 98	300 m N of ROW
	DkPr-9	Cultural Material, Surface, Lithics	unknown	200 m W of ROW
	DkPr-10	Cultural Material, Surface, Lithics	200 x 50	ROW passes through site
	DkPr-11	Cultural Material, Surface, Lithics	100 x 25	425 m SW of ROW
	DkPr-15	Cultural Material, Surface, Lithics	unknown	115 m E of ROW
	DkPr-16	Cultural Material, Surface, Lithics	unknown	190 m W of ROW
	DkPr-26	Cultural Material, Subsurface, Faunal, Lithics	unknown	ROW passes through site
	DkPr-27	Cultural Material, Subsurface, Lithics	16 x 10	ROW passes through site
	DkPr-28	Cultural Material, Subsurface, Faunal, Lithics	13 x 9	ROW passes through site
	DkPr-29	Cultural Material, Subsurface, Lithics	5 x 5	315 m E of ROW
	DlPr-22	Cultural Material, Surface, Lithics	unknown	225 m W of ROW
	DlPr-23	Cultural Material, Surface, Lithics	unknown	ROW may pass through site
	DlPr-29	Cultural Material, Surface, Lithics	unknown	300 m W of ROW
	EaPq-4	Subsistence Feature, Hearth	unknown	230 m N of ROW
	EaPq-6	Cultural Material, Surface, Lithics	60 x 5	200 m N of ROW
	EaPq-8	Cultural Material, Subsurface, Lithics	50 x 25	400 m N of ROW
	EaPq-9	Cultural Material, Subsurface, Lithics	115 x 85	140 m W of ROW
	EaPr-4	Cultural Material, Surface, Lithics	50 x 5	700 m W of ROW
	EaPr-11	Cultural Material, Subsurface, Lithics	80 x 20	120 m S of ROW
	EaPr-12	Cultural Material, Subsurface, Lithics	30 x 12	90 m E of ROW
	EaPr-21	Cultural Material, Subsurface, Lithics	59 x 35	160 m W of ROW
	EaPr-22	Cultural Material, Subsurface, Lithics	35 x 25	200 m W of ROW
	EaPr-25	Cultural Material, Subsurface, Lithics	33 x 8	400 m N of ROW
	EbPr-1	Cultural Material, Surface, Lithics	100 x 5	Adjacent to ROW on E (plotted wrong on RAAD)

Table 1: Registered precontact archaeological sites in proximity to project area.

One new archaeological site was discovered during the PFR of the CASNEL Lateral, at CASNEL 76 (DiQj-18-T01). This site will be recorded with the BC Archaeology Branch Site Inventory Section following the submission of the AOA report.

5.2 Archaeological Potential Assessment

5.2.1 Set 3

Analysis of the existing archaeological record and air photos resulted in the traverse capture of terrain with potential for associated archaeological deposits and/or features within a GIS (shapefiles, Appendix 1).

5.3 Preliminary Field Reconnaissance

The PFR report previously submitted (Stantec 2018) identifies the various overlaps between appurtenance and archaeological potential polygons and vectors. Results of the field reconnaissances varied as widely as the settings and access would suggest. They are presented in Appendix 2 and summarized in Table 2 below.

LAT/LOOP	# AIA (Identified prior to PFR)	# PFR Locations	# MONITOR	# PFR -> AIA
Trail Lateral 168	0	21	0	11
Celgar Lateral 168	0	9	0	6
Castlegar-Nelson Lateral 168	10	113	2	30
Cranbrook Lateral 168	6	58	0	12
Cranbrook Loop 219	1	7*	0	4
Cranbrook Loop 273	29	26	0	8
Kimberley Lateral 168	0	60	1	39
Skookumchuck Lateral 219	0	24	0	11
Fording Lateral 168 and 219	25	188	0	65
Elk Lateral 168	0	8	0	4

Table 2: Results of the Overview Assessment and Preliminary Field Reconnaissances.

A table with information pertaining to the composition of field crews for each project, and a summary of PFR observations, including field photos for each lateral and loop, are provided in Appendix 3.

6 Recommendations

The objective of this AOA has been to identify locations where intact significant precontact archaeological deposits and features are likely to be present that could be adversely affected by the proposed Fortis pipeline upgrades in the Kootenay Region. This was accomplished via a staged process that involved the synthesis of background information to identify landforms and landscapes with archaeological potential and their delineation in a GIS. The entire lengths of all laterals and loops were assessed (Appendix 1). The resulting polygons and vectors were then overlaid with the locations of the various proposed appurtenance installations, resulting in the identification of potential locations where archaeological impact assessments (AIAs) might be required.

This process was constrained by the available digital map resources, in particular, TRIM 20 m contour mapping, which severely limits the delineation of landforms in areas of relatively subtle

microtopography such as the floors of the typically broad, wide large valleys that most of the pipelines traverse. In addition, none of the laterals and loops that comprise the project area have ever been subject to any systematic archaeological investigation. Because of these factors, the status of many of these potential AIA locations was not well enough known in terms of the actual topography and landform boundaries as well as the condition of the terrain in the identified appurtenance locations, that confidence could be placed at the outset in the development of cost estimates. It was therefore recognized that field reconnaissance would provide a most valuable adjunct to the archaeological potential mapping prior to the cost estimate component of this project.

These considerations account for both the relatively low number of AIA locations confidently identified as a result of the archaeological potential mapping (Table 3) as well as the large proportion of locations recorded in the field as being too severely disturbed to have the capacity to yield information via the application of archaeological data recovery techniques (Appendix 2).

The outcome of this process is a more confident identification of locations where AIAs will be required if the proposed appurtenance installations proceed. The specific locations and the individual descriptions and recommendations are provided in Appendix 2. This information is now suitable for the next phase of this project: the development of the cost estimates for the future upgrades.

7 References

8 Appendix 1. Polygon and Vector Archaeological Potential Attributes

LATERAL	ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
TRAIL 168	AP Vector TR-01	delta-fan terrace	proglacial lake basin
CELGAR 168	AP Vector CEL-01	rock-defended? terrace	proglacial lake basin
	AP Vector CEL-02	apron-terrace	proglacial lake basin
CASTLEGAR – NELSON 168	AP Vector CN-01	apron-terrace	downcutting river
	AP Vector CN-02	delta-fan terrace	proglacial lake basin
	AP Vector CN-03	delta-fan terrace remnant	proglacial lake basin
	AP Vector CN-04	delta-fan terrace remnant	proglacial lake basin
	AP Vector CN-05	terrace remnant	proglacial lake basin
	AP Vector CN-06	apron-terrace / beach?	proglacial lake basin
	AP Vector CN-07	apron-terrace / beach?	proglacial lake basin
	AP Vector CN-08	delta terrace	proglacial lake basin
	AP Vector CN-09	delta-fan terrace remnant	proglacial lake basin
	AP Vector CN-10	kame terrace remnant	proglacial lake basin
	AP Vector CN-11	rock-defended? apron-terraces	proglacial lake basin
	AP Vector CN-12	kame terrace remnants	proglacial lake basin

Table 3: West Kootenay Laterals (Celgar, Trail & Casnel)

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C11-01	terrace, fan	watercourse confluence
AP Polygon C11-02	elevated delta?-fan terrace	relict watercourse
AP Polygon C11-04	terrace/fan complex	watercourse confluence
AP Polygon C11-06	terrace complex	present and relict watercourses
AP Polygon C11-07	delta-fan terrace	relict standing water
AP Polygon C11-08	terrace	relict watercourse
AP Polygon C11-10	terrace complex	present and relict watercourses
AP Polygon C11-11	terrace-fan complex	watercourse confluence
AP Polygon C11-19	elevated terrace	relict watercourse
AP Polygon C11-55	elevated delta?- fan terrace complex	relict watercourse confluence
AP Polygon C11-67	elevated delta?- fan terrace remnant	relict watercourse confluence
AP Polygon C11-93	terrace-fan complex	watercourse confluence (relict divide?)
AP Vector Crk-01	apron-terrace complex	watercourse and relict spillway?
AP Vector Crk-02	elevated terrace remnant?	relict watercourse and relict spillway?
AP Vector Crk-03	elevated delta?- fan terrace margin	relict watercourse confluence
AP Vector Crk-04	elevated delta?- fan remnant?	relict watercourse confluence
AP Vector Crk-05	elevated delta?- fan terrace remnant?	relict watercourse confluence
AP Vector Crk-06	elevated terrace remnant?	relict watercourse confluence
AP Vector Crk-07	terraces	relict and present watercourse, wetland, relict spillway?
AP Vector Crk-08	apron-terrace complex	watercourse and wetland

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Vector Crk-09	apron-terrace complex	watercourse and wetland
AP Vector Crk-10	apron-terrace complex	relict drainage network
AP Vector Crk-11	apron-terrace complex	modern and relict drainage network
AP Vector Crk-12	apron-terrace complex	watercourse
AP Vector Crk-13	terrace	watercourses

Table 4: Cranbrook Lateral and Loop 168

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C30-54	terrace	relict watercourse
AP Polygon C30-69	structural bench	kettle lakes
AP Polygon C30-C1	terrace	relict watercourse
AP Polygon C30-C2	terrace	relict watercourse
AP Vector Crk-13	terrace	watercourses
AP Vector Crk-14	apron-terrace complex	watercourse and wetland
AP Vector Crk-15	apron-terrace complex	watercourse and relict spillway
AP Vector Crk-16	terrace complex	modern and relict watercourse
AP Vector Crk-17	elevated terrace	modern and relict watercourse
AP Vector Crk-18	elevated terrace	relict watercourse

Table 5: Cranbrook-Kimberley Loop 273

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C30-C1	terrace	relict watercourse
AP Vector Crk-19	elevated terrace	relict and recent watercourses
AP Vector K-02	elevated terrace margin	relict watercourse
AP Vector K-03	elevated terraces	relict watercourse

Table 6: Cranbrook-Kimberley Loop 219

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C30-C1	terrace	relict watercourse
AP Vector K-01	alluvial fans	relict watercourses, confluence
AP Vector K-02	elevated terrace margin	relict watercourse
AP Vector K-03	elevated terraces	relict watercourse
AP Vector K-04	elevated terraces	relict watercourse
AP Vector K-05	elevated terraces	relict watercourse
AP Vector K-06	terraces, fluvial bars, apron	relict watercourse
AP Vector K-07	dissected till plain; elevated terraces	relict watercourses, confluence

Table 7: Kimberley Lateral 168

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C32-31	terraces, aprons	recent and relict watercourses, kettle pond
AP Polygon I03-101	outwash plain terrace	relict watercourse
AP Polygon I03-116	outwash plain terrace	relict watercourse

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon I03-125	terraces	recent and relict watercourses, kettle pond
AP Vector SKK-01	terraces	recent and relict watercourses
AP Vector SKK-02	elevated terrace margin, saddle, prominence	recent and relict watercourses, kettle ponds
AP Vector SKK-03	terraces	recent and relict watercourses, kettle pond
AP Vector SKK-04	swales, terraces, prominences	relict watercourses, kettle ponds
AP Vector SKK-05	swales, terraces, prominences	relict watercourse, kettle ponds
AP Vector SKK-06	elevated terraces	recent and relict watercourse
AP Vector SKK-07	dissected till plain; terraces	relict watercourses, confluence

Table 8: Skookumchuck Lateral 219

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Vector ELK -01	terraces	recent and relict watercourse

Table 9: Elkview Lateral 168

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Polygon C19-37	terrace	recent and relict watercourse
AP Polygon C19-35	terrace sequence	recent and relict watercourses
AP Polygon C19-03	terraces	watercourse
AP Polygon C21-01	alluvial fan, terraces	watercourses
AP Polygon C21-03	alluvial fan, confluence	watercourse
AP Polygon C21-03A	apron, terrace	watercourse
AP Polygon C21-04A	fans, terrace	watercourses
AP Polygon C21-06	terraces	watercourse
AP Polygon C21-09	terraces, fans	watercourses, confluences
AP Polygon C21-10	terraces, fans	watercourses, confluences
AP Polygon C21-11	terraces, fans	watercourses, confluences
AP Polygon C21-43	terrace, fan	watercourses, confluences
AP Polygon C21-55	alluvial fan, terraces	watercourses, confluence
AP Polygon C21-56	alluvial fan, terraces	watercourses, confluence
AP Polygon C21-71	alluvial fan, terraces	watercourses, confluence
AP Polygon C21-72	alluvial fans	watercourses, confluence
AP Polygon C21-73	terraces	watercourses, confluence
AP Polygon C23-130	alluvial fans	watercourse
AP Polygon C23-133	alluvial fans	watercourses
AP Polygon C23-150	alluvial fans	watercourse
AP Polygon C23-151	alluvial fan	watercourse
AP Polygon C23-152	terraces	recent and relict watercourse
AP Polygon C38-02	terrace	relict watercourse
AP Polygon C38-04	alluvial fan, saddle	watercourses, confluences
AP Polygon EVOEV-01	terraces	recent and relict watercourses
AP Polygon EVOEV-02	terraces	recent and relict watercourses
AP Vector FRD -01	delta-fan terrace remnant	proglacial lake basin

ARCHAEOLOGICAL UNIT	LANDFORM	HYDROLOGY
AP Vector FRD -02	alluvial floodplain terrace	recent watercourse
AP Vector FRD -03	apron, alluvial fan	recent watercourse
AP Vector FRD -04	terrace sequence	watercourse
AP Vector FRD -05	terrace sequence, fans, apron, prominence	recent and relict watercourse
AP Vector FRD -06	terraces	recent and relict watercourse
AP Vector FRD -07	alluvial floodplain	watercourse
AP Vector FRD -08	alluvial floodplain	watercourse
AP Vector FRD -09	intermediate terrace	relict watercourse
AP Vector FRD -10	terraces and fans	recent and relict watercourses
AP Vector FRD -11	terraces	recent and relict watercourses
AP Vector FRD -12	margin of drift plain	relict watercourse
AP Vector FRD -13	alluvial floodplain opposite Grave Prairie	watercourse
AP Vector FRD -14	terraces, prominences	relict watercourse
AP Vector FRD -15	terraces, saddles	recent and relict watercourses
AP Vector FRD -16	terrace?	relict watercourse
AP Vector FRD -17	terraces, alluvial floodplain	watercourse
AP Vector FRD -18	colluvial apron, fans and alluvial floodplain	watercourses, confluences
AP Vector FRD -19	alluvial fan	watercourse, confluence
AP Vector FRD -20	apron, alluvial fan	watercourse
AP Vector FRD -21	terrace	watercourse

Table 10: Fording Laterals 168 and 219

9 Appendix 2. PFR Results and Recommendations

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
TRA01 - 09	No access during reconnaissance	AIA
TRA10	Deflated	LOW Potential
TRA11	Deflated	LOW Potential
TRA12 - 13	Terraces adjacent to tributary watercourse	AIA
TRA14 - 21	Severely disturbed by development	LOW Potential

Trail Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CEL1	Terrace	AIA
CEL2	Terrace	AIA
CEL3	Steep slope	LOW Potential
CEL4	Terrace	AIA
CEL5	Terrace	AIA
CEL6	Terrace, prominence	AIA
CEL7	Terrace	AIA
CEL8	No archaeologically significant microtopography	LOW Potential
CEL9	Severely disturbed by development	LOW Potential

Celgar Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CASNEL01	Severely disturbed by development	LOW Potential
CASNEL02	Severely disturbed by development	LOW Potential
CASNEL03	Severely disturbed by development	LOW Potential
CASNEL04	Severely disturbed by development	LOW Potential
CASNEL05	Terrace	AIA
CASNEL06	Within a relict drainage	LOW Potential
CASNEL07	Terrace at confluence	AIA
CASNEL08	Terrace	AIA
CASNEL09	No access	AIA
CASNEL10	Severely disturbed by development	AIA
CASNEL11	Severely disturbed by development	AIA
CASNEL12	No access	LOW Potential
CASNEL13	No access	LOW Potential
CASNEL14	No access	LOW Potential
CASNEL15	No access	LOW Potential
CASNEL16	No access	LOW Potential
CASNEL17	No access	LOW Potential
CASNEL18	No access	AIA
CASNEL19	No access	AIA

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CASNEL20	No access	AIA
CASNEL21	No access	AIA
CASNEL22	Severely disturbed by development	LOW Potential
CASNEL23	Slope	LOW Potential
CASNEL24	Slope	LOW Potential
CASNEL25	Slope	LOW Potential
CASNEL26	Slope	LOW Potential
CASNEL27	Terrace	AIA
CASNEL28	Severely disturbed by development	LOW Potential
CASNEL29	Prominence	AIA
CASNEL30	Severely disturbed by development	LOW Potential
CASNEL31	Severely disturbed by development	LOW Potential
CASNEL32	Prominence	AIA
CASNEL33	Slope	LOW Potential
CASNEL34	Slope	LOW Potential
CASNEL35	Slope, disturbed	LOW Potential
CASNEL36	Severely disturbed by development	LOW Potential
CASNEL37	Slope	LOW Potential
CASNEL38	Slope	LOW Potential
CASNEL39	Slope	LOW Potential
CASNEL40	Fan, tributary watercourse	AIA
CASNEL41	Slope, disturbed	LOW Potential
CASNEL42	Slope, disturbed	LOW Potential
CASNEL43	Slope, disturbed	LOW Potential
CASNEL44	Slope, disturbed	LOW Potential
CASNEL45	Slope, disturbed	LOW Potential
CASNEL46	Slope, disturbed	LOW Potential
CASNEL47	Slope, disturbed	LOW Potential
CASNEL48	Slope, disturbed	LOW Potential
CASNEL49	Slope, disturbed	LOW Potential
CASNEL50	Slope, disturbed	LOW Potential
CASNEL51	Slope, disturbed	LOW Potential
CASNEL52	Slope, disturbed	LOW Potential
CASNEL53	Slope, disturbed	LOW Potential
CASNEL54	Slope, disturbed	LOW Potential
CASNEL55	Slope, disturbed	LOW Potential
CASNEL56	Slope, disturbed	LOW Potential
CASNEL57	Access problems	LOW Potential
CASNEL58	Access problems	AIA
CASNEL59	Slope, disturbed	LOW Potential
CASNEL60	Slope, disturbed	LOW Potential
CASNEL 61	Level, seasonal watercourse	AIA
CASNEL 62	Terrace remnant	MONITOR
CASNEL 63	Slope, disturbed	LOW Potential
CASNEL 64	Wetland	LOW Potential
CASNEL 65	Wetland	LOW Potential
CASNEL 66	Severely disturbed by development	LOW Potential
CASNEL 67	Terrace	AIA
CASNEL 68	Severely disturbed by development	LOW Potential
CASNEL 69	Severely disturbed by development	LOW Potential
CASNEL 70	Severely disturbed by development	LOW Potential

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CASNEL 71	Severely disturbed by development	LOW Potential
CASNEL 72	Severely disturbed by development	LOW Potential
CASNEL 73	Severely disturbed by development	LOW Potential
CASNEL 74	Terrace	AIA
CASNEL 75	Terrace	AIA
CASNEL 76	Terrace	AIA
CASNEL 77	Severely disturbed by development	LOW Potential
CASNEL 78	Terrace	AIA
CASNEL 79	Terrace	AIA
CASNEL 80	Terrace	AIA
CASNEL 81	No access	AIA
CASNEL 82	No access	AIA
CASNEL 83	Irregular slope	LOW Potential
CASNEL 84	Irregular slope	LOW Potential
CASNEL 85	Terrace	AIA
CASNEL 86	Terrace	MONITOR
CASNEL 87	Slope	LOW Potential
CASNEL 88	No access	AIA
CASNEL 89	No access	AIA
CASNEL 90	Severely disturbed by development	LOW Potential
CASNEL 91	Wetland	LOW Potential
CASNEL 92	Severely disturbed by development	LOW Potential
CASNEL 93	Severely disturbed by development	LOW Potential
CASNEL 94	Severely disturbed by development	LOW Potential
CASNEL 95	Severely disturbed by development	LOW Potential
CASNEL 96	Severely disturbed by development	LOW Potential
CASNEL 97	Severely disturbed by development	LOW Potential
CASNEL 98	Severely disturbed by development	LOW Potential
CASNEL 99	Severely disturbed by development	LOW Potential
CASNEL 100	Severely disturbed by development	LOW Potential
CASNEL 101	Severely disturbed by development	LOW Potential
CASNEL 102	Severely disturbed by development	LOW Potential
CASNEL 103	Severely disturbed by development	LOW Potential
CASNEL 104	Severely disturbed by development	LOW Potential
CASNEL 105	Severely disturbed by development	LOW Potential
CASNEL 106	Severely disturbed by development	LOW Potential
CASNEL 107	Severely disturbed by development	LOW Potential
CASNEL 108	Severely disturbed by development	LOW Potential
CASNEL 109	Severely disturbed by development	LOW Potential
CASNEL 110	Severely disturbed by development	LOW Potential
CASNEL 111	Severely disturbed by development	LOW Potential
CASNEL 112	Severely disturbed by development	LOW Potential
CASNEL 113	Severely disturbed by development	LOW Potential

Castlegar-Nelson Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CRK01	Terrace adjacent to tributary watercourse	AIA

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CRK02	Severely disturbed by development	LOW Potential
CRK03	Severely disturbed by development	LOW Potential
CRK04	Severely disturbed by development	LOW Potential
CRK05	Severely disturbed by development	LOW Potential
CRK06	Severely disturbed by development	LOW Potential
CRK07	Severely disturbed by development	LOW Potential
CRK08	Severely disturbed by development	LOW Potential
CRK09	Severely disturbed by development	LOW Potential
CRK10	Severely disturbed by development	LOW Potential
CRK11	Severely disturbed by development	LOW Potential
CRK12	Severely disturbed by development	LOW Potential
CRK13	Severely disturbed by development	LOW Potential
CRK14	Terrace	AIA
CRK15	Rocky lowland	LOW Potential
CRK16	Rocky, disturbed	LOW Potential
CRK17	Terrace adjacent to watercourse	AIA
CRK18	Terrace adjacent to watercourse	AIA
CRK19	Terrace adjacent to watercourse	AIA
CRK20	Terrace	AIA
CRK21	Terrace	AIA
CRK22	Terrace adjacent to wetland	AIA
CRK23	Terrace adjacent to wetland	AIA
CRK24	Slope	LOW Potential
CRK25	Slope	LOW Potential
CRK26	Slope	LOW Potential
CRK27	Slope	LOW Potential
CRK28	Slope	LOW Potential
CRK29	Slope, disturbed	LOW Potential
CRK30	Severely disturbed by development	LOW Potential
CRK31	Severely disturbed by development	LOW Potential
CRK32	Terrace	AIA
CRK33	Slope, disturbed	LOW Potential
CRK34	Slope, disturbed	LOW Potential
CRK35	Slope, disturbed	LOW Potential
CRK36	Slope, disturbed	LOW Potential
CRK37	Slope, disturbed	LOW Potential
CRK38	Slope	LOW Potential
CRK39	Slope	LOW Potential
CRK40	No archaeologically significant microtopography	LOW Potential
CRK41	No archaeologically significant microtopography	LOW Potential
CRK42	No archaeologically significant microtopography	LOW Potential
CRK43	Slope, disturbed	LOW Potential
CRK44	Rocky slope, disturbed	LOW Potential
CRK45	Severely disturbed by development	LOW Potential
CRK46	Severely disturbed by development	LOW Potential
CRK47	No archaeologically significant microtopography	LOW Potential
CRK48	Rocky, irregular, disturbed	LOW Potential

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CRK49	No archaeologically significant microtopography, disturbed	LOW Potential
CRK50	No archaeologically significant microtopography, disturbed	LOW Potential
CRK51	Terrace	AIA
CRK52	Severely disturbed by development	LOW Potential
CRK53	Terrace	AIA
CRK54	No archaeologically significant microtopography, disturbed	LOW Potential
CRK55	Rocky slope, disturbed	LOW Potential
CRK56	No archaeologically significant microtopography, disturbed	LOW Potential
CRK57	No archaeologically significant microtopography, disturbed	LOW Potential
CRK58	No archaeologically significant microtopography, disturbed	LOW Potential

Cranbrook Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CRKLP09	Fluvial bar	AIA
CRKLP10	Severely disturbed by development	LOW Potential
CRKLP11	Severely disturbed by development	LOW Potential
CRKLP12	Terrace	AIA
CRKLP13	Structural bench	AIA
CRKLP14	Severely disturbed by development	LOW Potential
CRKLP15	Terrace, prominence	AIA

Cranbrook Loop 219

* Note: CRKLP01 – 08 are the same locations as KBY48 – 56

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
CRKLOP01	Severely disturbed by development	LOW Potential
CRKLOP02	Severely disturbed by development	LOW Potential
CRKLOP03	Severely disturbed by development	LOW Potential
CRKLOP04	Severely disturbed by development	LOW Potential
CRKLOP05	Severely disturbed by development	LOW Potential
CRKLOP06	Severely disturbed by development	LOW Potential
CRKLOP07	Severely disturbed by development	LOW Potential
CRKLOP08	Severely disturbed by development	LOW Potential
CRKLOP09	Recent watercourse	LOW Potential
CRKLOP10	Within archaeological site DjPw-4	AIA
CRKLOP11	Severely disturbed by development	LOW Potential
CRKLOP12	Severely disturbed by development	LOW Potential
CRKLOP13	Terrace	AIA
CRKLOP14	Slope, disturbed	LOW Potential
CRKLOP15	Slope	LOW Potential

CRKLOP16	Depression / wetland	LOW Potential
CRKLOP17	Within archaeological site DjPw-20	AIA
CRKLOP18	Within archaeological site DjPw-21	AIA
CRKLOP19	No archaeologically significant microtopography, disturbed	LOW Potential
CRKLOP20	No archaeologically significant microtopography, disturbed	LOW Potential
CRKLOP21	No archaeologically significant microtopography, disturbed	LOW Potential
CRKLOP22	No archaeologically significant microtopography, disturbed	LOW Potential
CRKLOP23	Terrace adjacent to watercourse	AIA
CRKLOP24	Terrace adjacent to watercourse	AIA
CRKLOP25	Terrace adjacent to watercourse	AIA
CRKLOP26	Terrace adjacent to watercourse	AIA

Cranbrook Loop 273

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
KBY01	Terrace above tributary watercourse	AIA
KBY02	Severely disturbed by development	LOW Potential
KBY03	Terrace above tributary watercourse	AIA
KBY04	Severely disturbed by development	LOW Potential
KBY05	Terrace above tributary watercourse	AIA
KBY06	Terrace above tributary watercourse	AIA
KBY07	High terrace	AIA
KBY08	High terrace	AIA
KBY09	High terrace	AIA
KBY10	High terrace	AIA
KBY11	High terrace	AIA
KBY12	High terrace	AIA
KBY13	High terrace	AIA
KBY14	Prominence	AIA
KBY15	Severely disturbed by development	LOW Potential
KBY16	Prominence	AIA
KBY17	Prominence	AIA
KBY18	Prominence	AIA
KBY19	Prominence	AIA
KBY20	Severely disturbed by development	LOW Potential
KBY21	Terrace	AIA
KBY22	Slope, disturbed	LOW Potential
KBY23	No archaeologically significant microtopography, disturbed	LOW Potential
KBY24	Terrace	AIA
KBY25	Terrace	AIA
KBY26	Prominence	AIA
KBY27	Terrace	AIA
KBY28	Terrace	AIA
KBY29	Terrace	AIA
KBY30	Severely disturbed by development	LOW Potential
KBY31	Terrace	AIA

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
KBY32	Terrace	AIA
KBY33	Terrace	MONITOR
KBY34	Terrace	AIA
KBY35	Terrace	AIA
KBY36	Slope, disturbed	LOW Potential
KBY37	Slope, disturbed	LOW Potential
KBY38	Slope, disturbed	LOW Potential
KBY39	Terrace	AIA
KBY40	Terrace	AIA
KBY41	Terrace	AIA
KBY42	Terrace	AIA
KBY43	Terrace	AIA
KBY44	Terrace	AIA
KBY45	Severely disturbed by development	LOW Potential
KBY46	Terrace	AIA
KBY47	Slope, disturbed	LOW Potential
KBY48	Terrace	AIA
KBY49	Terrace	AIA
KBY50	Prominence	AIA
KBY51	Structural bench	AIA
KBY52	Slope, disturbed	LOW Potential
KBY53	Severely disturbed by development	LOW Potential
KBY54	Severely disturbed by development	LOW Potential
KBY55	Severely disturbed by development	LOW Potential
KBY56	Severely disturbed by development	LOW Potential
KBY57	Terrace	LOW Potential
KBY58	Terrace	LOW Potential
KBY59	Terrace	AIA
KBY60	Severely disturbed by development	LOW Potential

Kimberley Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
SKK01	No access; observed from road	LOW Potential
SKK02	No access; cultivated	LOW Potential
SKK03	Terraces adjacent to wetland	AIA
SKK04	Terraces adjacent to wetland	AIA
SKK05	Irregular rocky topography, disturbed	LOW Potential
SKK06	Terrace interior, disturbed	LOW Potential
SKK07	Terrace, prominence	AIA
SKK08	Structural bench, prominence	AIA
SKK09	Terrace	AIA
SKK10	disturbed	LOW Potential
SKK11	Terrace	AIA
SKK12	No archaeologically significant microtopography, disturbed	LOW Potential
SKK13	Level terrace	AIA
SKK14	Terrace	AIA
SKK15	Terrace	AIA

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
SKK16	prominence	AIA
SKK17	prominence	AIA
SKK18	No archaeologically significant microtopography	LOW Potential
SKK19	No archaeologically significant microtopography	LOW Potential
SKK20	No archaeologically significant microtopography	LOW Potential
SKK21	No archaeologically significant microtopography	LOW Potential
SKK22	No archaeologically significant microtopography	LOW Potential
SKK23	disturbed	LOW Potential
SKK24	disturbed	LOW Potential

Skookumchuck Lateral 219

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
FRD01	Severely disturbed by development	LOW Potential
FRD02	Severely disturbed by development	LOW Potential
FRD03	Severely disturbed by development	LOW Potential
FRD04	Severely disturbed by development	LOW Potential
FRD05	Severely disturbed by development	LOW Potential
FRD06	No access	AIA
FRD07	No access	AIA
FRD08	No access	AIA
FRD09	No access	AIA
FRD10	No access	AIA
FRD11	Severely disturbed by development	LOW Potential
FRD12	Severely disturbed by development	LOW Potential
FRD13	Severely disturbed by development	LOW Potential
FRD14	Severely disturbed by development	LOW Potential
FRD15	Slope	LOW Potential
FRD16	Slope	LOW Potential
FRD17	Slope	LOW Potential
FRD18	Slope	LOW Potential
FRD19	prominence	AIA
FRD20	Structural bench	AIA
FRD21	prominence	AIA
FRD22	Alluvial fan	AIA
FRD23	rocky	LOW Potential
FRD24	disturbed	LOW Potential
FRD25	No archaeologically significant microtopography, disturbed	LOW Potential
FRD26	No archaeologically significant microtopography, disturbed	LOW Potential
FRD27	No archaeologically significant microtopography	LOW Potential
FRD28	No archaeologically significant microtopography	LOW Potential

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
FRD29	Slope	LOW Potential
FRD30	Terrace	AIA
FRD31	No archaeologically significant microtopography	LOW Potential
FRD32	Terrace	AIA
FRD33	Terrace	AIA
FRD34	Slope	LOW Potential
FRD35	No access	AIA
FRD36	No access	AIA
FRD37	Wetland, disturbed	LOW Potential
FRD38	floodplain, disturbed	LOW Potential
FRD39	Terrace	AIA
FRD40	Terrace	AIA
FRD41	Wetland	Wetland
FRD42	Terrace	AIA
FRD43	Terrace	AIA
FRD44	Slope, disturbed	LOW Potential
FRD45	Slope, disturbed	LOW Potential
FRD46	Slope, disturbed	LOW Potential
FRD47	Slope, disturbed	LOW Potential
FRD48	Wetland	LOW Potential
FRD49	Slope, disturbed	LOW Potential
FRD50	No archaeologically significant microtopography, disturbed	LOW Potential
FRD51	Wetland, disturbed	LOW Potential
FRD52	Severely disturbed by development	LOW Potential
FRD53	Severely disturbed by development	LOW Potential
FRD54	Severely disturbed by development	LOW Potential
FRD55	Severely disturbed by development	LOW Potential
FRD56	Severely disturbed by development	LOW Potential
FRD57	Severely disturbed by development	LOW Potential
FRD58	Severely disturbed by development	LOW Potential
FRD59	Not accessed	AIA
FRD60	Not accessed	AIA
FRD61	Not accessed	LOW Potential
FRD62	Not accessed	LOW Potential
FRD63	Not accessed	LOW Potential
FRD64	Not accessed	LOW Potential
FRD65	Not accessed	LOW Potential
FRD66	Not accessed	AIA
FRD67	Slope, disturbed	LOW Potential
FRD68	Slope, disturbed	LOW Potential
FRD69	Slope, disturbed	LOW Potential
FRD70	prominence	AIA
FRD71	Severely disturbed by development	LOW Potential
FRD72	Wetland	LOW Potential
FRD73	Terrace	AIA
FRD74	prominence	AIA
FRD75	Terrace	AIA
FRD76	Severely disturbed by development	LOW Potential
FRD77	Rocky, disturbed	LOW Potential
FRD78	Severely disturbed by development	LOW Potential

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
FRD79	Severely disturbed by development	LOW Potential
FRD80	Terrace	AIA
FRD81	Terrace	AIA
FRD82	recent floodplain	LOW Potential
FRD83	Severely disturbed by development	LOW Potential
FRD84	recent floodplain	LOW Potential
FRD85	prominence	AIA
FRD86	recent floodplain	LOW Potential
FRD87	recent floodplain	LOW Potential
FRD88	recent floodplain	LOW Potential
FRD89	recent floodplain	LOW Potential
FRD90	prominence	AIA
FRD91	recent floodplain	LOW Potential
FRD92	Slope, disturbed	LOW Potential
FRD93	recent floodplain	LOW Potential
FRD94	recent floodplain	LOW Potential
FRD95	recent floodplain	LOW Potential
FRD96	No archaeologically significant microtopography, disturbed	LOW Potential
FRD97	Terrace	AIA
FRD98	Severely disturbed by development	LOW Potential
FRD99	Slope, disturbed	LOW Potential
FRD100	No access	AIA
FRD101	No access	AIA
FRD102	No access	AIA
FRD103	recent floodplain	LOW Potential
FRD104	Terrace	AIA
FRD105	Terrace	AIA
FRD106	Terrace	AIA
FRD107	Alluvial fan	LOW Potential
FRD108	Severely disturbed by development	AIA
FRD109	Slope, disturbed	LOW Potential
FRD110	Terrace	AIA
FRD111	Terrace	AIA
FRD112	Severely disturbed by development	LOW Potential
FRD113	Severely disturbed by development	LOW Potential
FRD114	Terrace	AIA
FRD115	Severely disturbed by development	LOW Potential
FRD116	Severely disturbed by development	LOW Potential
FRD117	Terrace	AIA
FRD118	No archaeologically significant microtopography, disturbed	LOW Potential
FRD119	recent floodplain	LOW Potential
FRD120	Terrace	AIA
FRD121	Terrace	AIA
FRD122	No archaeologically significant microtopography, disturbed	LOW Potential
FRD123	Terrace	AIA
FRD124	Slope, disturbed	LOW Potential
FRD125	No access	AIA
FRD126	No access	AIA
FRD127	No access	AIA

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
FRD128	No access	AIA
FRD129	No access	AIA
FRD130	No access	AIA
FRD131	No access	AIA
FRD132	Severely disturbed by development	LOW Potential
FRD133	Terrace	AIA
FRD134	Terrace	AIA
FRD135	recent floodplain	LOW Potential
FRD136	Terrace	AIA
FRD137	Severely disturbed by development	LOW Potential
FRD138	Severely disturbed by development	LOW Potential
FRD139	No access	LOW Potential
FRD140	Severely disturbed by development	LOW Potential
FRD141	Severely disturbed by development	LOW Potential
FRD142	Severely disturbed by development	LOW Potential
FRD143	Severely disturbed by development	LOW Potential
FRD144	Severely disturbed by development	LOW Potential
FRD145	recent floodplain, disturbed	LOW Potential
FRD146	recent floodplain, disturbed	LOW Potential
FRD147	recent floodplain, disturbed	LOW Potential
FRD148	recent floodplain, disturbed	LOW Potential
FRD149	Severely disturbed by development	LOW Potential
FRD150	Severely disturbed by development	LOW Potential
FRD151	Severely disturbed by development	LOW Potential
FRD152	Severely disturbed by development	LOW Potential
FRD153	Severely disturbed by development	LOW Potential
FRD154	Severely disturbed by development	LOW Potential
FRD155	Severely disturbed by development	LOW Potential
FRD156	Severely disturbed by development	LOW Potential
FRD157	Severely disturbed by development	LOW Potential
FRD158	Severely disturbed by development	LOW Potential
FRD159	Severely disturbed by development	LOW Potential
FRD160	Severely disturbed by development	LOW Potential
FRD161	Severely disturbed by development	LOW Potential
FRD162	Severely disturbed by development	LOW Potential
FRD163	Severely disturbed by development	LOW Potential
FRD164	No access	AIA
FRD165	No access	AIA
FRD166	recent floodplain	LOW Potential
FRD167	recent floodplain	LOW Potential
FRD168	Terrace	AIA
FRD169	Severely disturbed by development	LOW Potential
FRD170	Severely disturbed by development	LOW Potential
FRD171	Severely disturbed by development	LOW Potential
FRD172	relict floodplain terrace	AIA
FRD173	Severely disturbed by development	LOW Potential
FRD174	Terrace	AIA
FRD175	Terrace	AIA
FRD176	Severely disturbed by development	LOW Potential
FRD177	Terrace	AIA
FRD178	Terrace	AIA
FRD179	Slope, irregular	LOW Potential

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
FRD180	Terraces	AIA
FRD181	Slope, disturbed	LOW Potential
FRD182	wetland	LOW Potential
FRD183	Slope, disturbed	LOW Potential
FRD184	No access	AIA
FRD185	Slope, irregular, disturbed	LOW Potential
FRD186	Slope, irregular, disturbed	LOW Potential
FRD187	Slope, disturbed	LOW Potential
FRD188	prominences	AIA

Fording Lateral 168

PFR TARGET	DESCRIPTION	ASSESSMENT / RECOMMENDATION
ELK01	No access	LOW Potential
ELK 02	No access	LOW Potential
ELK 03	No access	LOW Potential
ELK 04	No access	LOW Potential
ELK 05	Terrace	AIA
ELK 06	Terrace	AIA
ELK 07	Terrace	AIA
ELK 08	Terrace	AIA

Elkview Lateral 168

10 Appendix 3. PFR In-field Crew Information, Field Observations and Photos

Summary of Dates and Field Crew Members during the PFR of the Set 3 Laterals and Loops

Assessment Component (Lateral or Loop)	Date of In-field Assessment	Field Crew and Affiliation / Notes
Fording Lateral 219	June 18 – 22, 2018	Jacob Liddy (Tipi Mountain [TMECS]) Corey Stevens (Shuswap Indian Band [SIB]) Marty Williams (Ktunaxa Nation Council [KNC])
Elkview Lateral 168	N/A	*No access to Teck Coal lands, PFR was not completed on Elkview Lateral*
Celgar Lateral 168	July 3 – 4, 2018	Lindsey Neill (TMECS) Josh Martin (SIB) Rayan Sieler (KNC) Carlie Scott (Osoyoos Indian Band [OIB])
Castlegar-Nelson (Casnel) Lateral 168	June 26 – 29, 2018	Lindsey Neill (TMECS) Josh Martin (SIB) Rayan Sieler (KNC) Carlie Scott (Osoyoos Indian Band [OIB])
Trail Lateral 168	June 25, 2018	Lindsey Neill (TMECS) Josh Martin (SIB) Rayan Sieler (KNC) Carlie Scott (Osoyoos Indian Band [OIB])
Cranbrook Lateral 168 and Loop 219	June 9 – 11, 2018	Andrea Thompson (TMECS) Marty Williams (KNC)
Cranbrook Loop2 219	June 9 – 11, 2018	Andrea Thompson (TMECS) Marty Williams (KNC)
Cranbrook Loop 273	June 9 – 11, 2018	Lara Mcfadden-Baltutis (TMECS) Joshua Martin (SIB)
Kimberley Lateral 68	June 9 – 11, 2018	Lara Mcfadden-Baltutis (TMECS) Joshua Martin (SIB)
Skookumchuck Lateral 219	June 10– 11, 2018	Andrea Thompson (TMECS) Marty Williams (KNC) Lara Mcfadden-Baltutis (TMECS) Joshua Martin (SIB)

Summary of In-field Observations for the Set 3 Laterals and Loops - with Representative Field Photos.

Assessment Component (Lateral or Loop)	Summary of In-field Observations	Photo
Fording Lateral 219	This lateral provided the highest number of PFR locations for all of Set 3, and also returned the greatest number of PFR locations that were confirmed for archaeological potential. This lateral also has the highest number of previously recorded archaeological sites for all of Set 3. In terms of intact versus disturbed terrain, these laterals cover both extremes, i.e. very lightly impacted terrain to areas where the landscape has seen the removal of all native fine sediments. Significant disturbance noted along the gas pipeline includes, but is not limited to: several areas where roads and highways are situated in proximity to the pipeline, parking lots and gravel roads and trails, and recent and past flood plain where fine sediments are [or have been] removed annually (or semi-annually). Archaeological potential was identified at 65 of 188 PFR locations identified during the PFR (35% positive). Added to this number, are 25 AIA locations identified during the desk review (which were not assessed during the PFR), giving a total of 90 AIA locations. During the AOA, archaeological potential was also identified in the overlap zone between the gas pipeline ROW and 26 previously identified AOA polygons, and 21 new potential vectors (see Table 10).	 View North of the gas pipeline along Fording Road, south of Teck Coal's Fording Operations.
Elkview Lateral 168	N/A – access was not granted to this lateral by Teck Coal Ltd.	N/A
Celgar Lateral 168	With regard to relative proportions of areas of potential, the Celgar lateral returned the most positives (PFR areas confirmed to have potential), with 6 out of 9 PFR locations being ranked as having high archaeological potential (66%). Terrain within the PFR assessment areas with arch potential is generally described as containing elevated terraces overlooking Lower Arrow Lake / Columbia River. In addition to the positive PFR locations, two archaeological potential vectors were identified during the AOA.	 View northeast of the Columbia River, from the high terrace upon which the gas pipeline has been constructed.

Castlegar-Nelson (Casnel) Lateral 168	Archaeological potential along the Casnel lateral is considered abundant, with much of the gas pipeline running adjacent to (west of) the Kootenay River, from its confluence with the Columbia in Castlegar in the south, and including the confluence of the Kootenay and Slocan Rivers in the north. Much of the terrain immediately bordering the rivers along the gas pipeline route has been included in previously defined AOA polygons (Kootenai West Heritage Consulting). 30 of the 113 proposed PFR locations (27%) were confirmed as having archaeological potential in the field, with an additional 12 archaeological potential vectors that were produced during the AOA.	 View east of a terrace margin along the Casnel Lateral.
Trail Lateral 168	Archaeological potential was confirmed at 11 of the 21 PFR locations along the Trail lateral (52%), primarily in the north of the gas pipeline. In the northern half (approx.) the pipeline traverses level to semi-level terrain in proximity to natural, unnamed water sources (higher elevation lakes and streams). Disturbance is significant and prevalent along the southern half of the lateral, with much of the assessment locations being situated within areas of industrial or residential development. Access to assessment areas in the north was, unfortunately, greatly limited by the fact that Teck Metals Inc. is the landowner and a request for access through Teck was not answered until several weeks following the PFR.	Due to access issues, no photos of high potential terrain are available for this assessment area.
Cranbrook Lateral 168 and Loop 219	A total of 12 PFR locations out of 58 were identified as having archaeological potential during the PFR survey (20%). In-field, the terrain assessed was generally disturbed in the northwestern portions of the lateral, and more intact in the southeast (outside of residential and industrial areas). Several long, flat, elevated terraces were noted, above (east of, the Gold Creek drainage in the south. A total of 6 AIA areas were identified during the desk review. The AOA resulted in the definition of 13 archaeological potential vectors and identified 12 previously defined AOA polygons that overlap with the gas pipeline along the Cranbrook lateral.	 View south-southeast of an elevated terrace above Gold Creek, in the northern half of Cranbrook lateral 168.

Cranbrook Loop2 219	Archaeological potential in the Cranbrook Loop 219 locale is generally predicated on the presence of elevated terraces and/or benches above relict or active drainages. Four of seven proposed PFR locations were confirmed for arch potential in the field (57%). One pre-existing AOA polygon and three new archaeological potential vectors were identified for assessment during the AOA.	 View northwest of an elevated terrace margin in Cranbrook Loop2 219.
Cranbrook Loop 273	Archaeological potential along Loop 273 comprises of both elevated benches and terraces above relict and active drainages in the centre and north, and elevated terrain adjacent to kettle lakes/depressions in the south of the assessment area. A total of 10 PFR locations were confirmed to have arch potential during assessment of 26 proposed locations (39%). Additionally, 29 locations were identified for AIA during the desk review, 6 vectors were identified during the AOA, and 4 pre-existing AOA polygons have been highlighted for assessment along this Loop.	 View north of a level area adjacent to (south of) a kettle lake in the south of the Loop 273 assessment area.
Kimberley Lateral 168	Archaeological potential along the Kimberley lateral was noted primarily in areas of low to moderate disturbance, outside of residential and industrial areas, and adjacent to the St, Mary River and a series of unnamed seasonal drainages (both active and relict). Landforms described as having potential are described as elevated terraces and benches. A total of 60 locations were assessed during the PFR, with 39 being identified as having confirmed archaeological potential (65%). Seven archaeological potential vectors have been identified for assessment during the AOA.	 View west of a high terrace above an active drainage, along the Kimberley lateral.

Skookumchuck Lateral 219	Archaeological potential along the Skookumchuck lateral is generally comprised of mid to high elevation terraces and benches situated above relict and active drainages. Eleven of 24 proposed PFR locations were confirmed as having archaeological potential during the PFR (46%). Seven vectors of archaeological potential were defined during the AOA, along with 4 pre-existing AOA polygon overlap areas.	 View north of an elevated terrace along the Skookumchuck lateral.

Appendix Q

CONSULTATION AND ENGAGEMENT

Appendix Q-1

INLAND GAS ENGAGEMENT PLAN

Inland Gas Upgrades

Community Engagement, Indigenous Relations and Communications

Prepared by

Last updated September 18, 2018

This plan is a working document, will be reviewed and updated on a regular basis as required, and takes us through to CPCN decision, expected in September 2019.

DRAFT

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BACKGROUND

The Inland Gas Upgrades Project is an extension of our existing system maintenance and monitoring operations. For the past 30 years, FortisBC Energy Inc. (FEI) has been upgrading its larger and medium-diameter transmission pipeline system throughout the service territory to allow running in-line inspection (ILI) tools, which effectively manage the threat of corrosion. FEI has more than 400 km of transmission pipelines that have not been upgraded to accommodate ILI tool inspection that are within the scope of the project. Most of these gas lines are laterals in the FEI Interior Transmission System (ITS). The proposed project includes 29 separate laterals located across the ITS.

The upgrades FEI is proposing to make to these 29 laterals will result in various levels of construction impacts to approximately 17 communities across B.C. The work will vary by region, as will the level of interest and the appropriate way to engage with stakeholders and rights holders.

Each lateral will be upgraded in one of three ways. The most impactful will be to remove bends and small parts that could block inspection equipment. The second option, replacing gas lines, is also impactful. The third option, regulating the pressure in sections of our system, is the least impactful. While the vast majority of this work will take place on existing right-of-ways, some work will require ground disturbance in potentially sensitive areas such as unique habitat and in traditional territories of Indigenous communities.

It is a priority for FEI to keep the public and other stakeholders informed about the Project both before and during construction.

SITUATION ANALYSIS

This Project presents several risks and opportunities:

Topics	Risks	Opportunities	Mitigation Tactics
Perception of pipeline projects and/or FEI • Positive/Negative experience w/ FEI	• Heavy opposition with respect to pipelines in BC • Potential to be linked to Kinder Morgan	• Reinforce FEI as safe and reliable operator, using the highest of safety standards	• Prepare key messaging that support safety and pipeline integrity/reliability the upgrade provides.
Changing political, regulatory landscape • October city elections • Increasing complexity with OCG and municipal permitting process • Time lag between CPCN approval and construction	• With the elections happening, we may fight for their time – may not be a priority • Permit process could cause project delays • Constituent concerns around safety, work in sensitive areas, disruption during construction	• Potential to get in front of municipalities prior to election season.	• Presentations at local government conferences • Communicate how we have incorporated local concerns into construction planning • Active communication to keep residents informed on potential construction impacts • Return work areas to the same condition or better than we found it
Indigenous communities • Overlapping land territories/rights • Navigating Treaty 8 bands	• Vast number of Indigenous communities to engage	• Show FEI's commitment to working closely with Indigenous communities • Demonstrate our leadership in working with Indigenous partners	• Working closely with local bands to make sure they have access to bid on eligible contracting opportunities • Maintain open and transparent dialogue with Community leaders • Show that we respect traditional territories, each Indigenous community's unique processes and concerns • Follow appropriate permitting and best practices for handling of habitat and artifacts
Environmental impacts • Alignment with municipal carbon reduction targets • Water crossing impacts	• Project carbon emission data/mitigation tactics not clearly identified in scope. • Construction could impede sensitive areas, such as where species are	• Provide insight to how FEI is working to reduce carbon emissions pertaining to the project.	• Demonstrate how options chosen will minimize environmental impacts • Demonstrate that we follow appropriate assessment, permitting and best practices for work in sensitive habitat

	at risk or water crossings		• Develop an issues management plan so we can act quickly and responsibly to any issues
Community/general public impacts • Traffic disruptions • Noise and dust associated with construction • Impact on businesses affected by construction • Site restoration and remediation • Customer rate impact • Right of way access	• Public access impacts in long stretches of the project (i.e. Kamloops).	• Show FEI's leadership in treating people fairly, • Incorporate local concerns into planning • Show how we work to minimize construction impacts and aim to return areas to the same or better than they found it	• Open, timely, transparent communication/engagement with land owners, and those most impacted by the project • Demonstrate quick and pro-active response to resolve issues • Provide direct access to a person they can talk to with concerns

PROJECT GOALS

1. Obtain approval from the BCUC to:
    a) implement integrity management solutions that will reduce the external corrosion hazard and/or limit potential consequences associated with time-dependent hazards; and
    b) implement cost effective proactive asset management solutions that will allow FEI to improve its ability to mitigate the potential rupture events.
2. Complete planning, design and construction of the project on time and on budget.
3. Continue safe and reliable operations.

ENGAGEMENT & COMMUNICATION GOALS

- Create awareness of the project, specifically within communities directly impacted by construction:
    - Ensure balanced and objective information is provided to all stakeholders regarding the upgrades;
    - Address stakeholder concerns to limit impacts or provide explanations when unable to do so;
    - Provide opportunity for public feedback
    - Demonstrate and raise awareness of the socio-economic benefits of the project
    - Keep the public informed about construction work that that could cause inconvenience.
- Ensure FEI meets communication and consultation requirements as established by its regulators
- To ensure stakeholder and rights holder engagement, and communications are consistent, coordinated, and appropriate for the audience

TARGET AUDIENCES

The table below is a list of the highest priority stakeholders and their expected concerns about the Project. How and when we communicate with each group will vary based on their concerns, the potential impacts to them, and their vested interests in the project. Refer to Appendices A and B for a comprehensive lists of the Project's key stakeholders and rights holders.

Stakeholders/Rights holders	Top concerns about the project
Local governments (municipal & regional)	safety, wildlife, fish habitat, economy, air/water quality, noise, economic benefits, permitting, constituent concerns
Indigenous communities	fish/habitat, wildlife, project benefits, consultation, heritage sites
Impacted landowners	safety, consultation, environmental impact, long term impacts, service interruptions
Impacted industrial customers	service interruptions, daily operation disturbances (ie. construction equipment onsite)
FEI customers	Short and long-term rate/bill impacts
General public	General impacts to them, ie. local road closures, park closures, etc.

OVERARCHING STRATEGY

As business and environmental landscapes shift, expectations for public consultation and engagement grow increasingly higher.

The Community Relations team will take a lead role engaging with key stakeholders and rights holders in both the pre-submission period and, if approved, the planning, permitting and construction phases. Community Relations work closely with the Indigenous Relations and Corporate Communications teams to make sure we are following a principled approach to working with Indigenous Communities and we are consistent, open and transparent in our messages to all interested parties.

The first phase of consultation during the pre-submission stage of the Project will consist of preliminary information sharing to key stakeholders, in addition to encouraging feedback throughout the process as more details of the Project, such as Project timelines, become available. The second phase of consultation will involve sharing a greater level of detail about the Project with affected stakeholders according to the level of potential impact.

Impact Levels

Subject matter experts working on the Project identified a number of key issues and impacts for each lateral. We reviewed this analysis to determine the appropriate level of Communication and Consultation for each stakeholder group. The key issues and impacts that will *significantly* influence Consultation and Communication requirements for the Project include:

- environmental impacts (such as close proximity to bodies of water, tree removals and sensitive habitat),
- public impacts (such as traffic/road disruptions, and disruption to daily operational-use of the land),

- competing land interests/rights,
- customer impacts (such as gas service disruption and rate increases), and
- the type of land involved in the operational work (such as park, heritage or archaeological sites).

FEI examined these key issues and impacts on a lateral-by-lateral basis and classified each lateral into three broad tiers. The Communication and Consultation strategies will be appropriate to the tier:

- **Tier One – High Impact Potential:** Laterals with the most public, environmental, and customer impacts; and permitting complexity will receive the most consultation and engagement focus.
- **Tier Two – Moderate Impact Potential:** Laterals with a lesser degree of public, environmental and customer impacts, and permitting requirements will receive a moderate amount of consultation and engagement focus.
- **Tier Three – Low Impact Potential:** Laterals with no or extremely limited public, environmental and customer impacts or permitting requirements will receive a minor amount of consultation and engagement focus.

This table shows each lateral by tier level, and corresponding preferred option:

Tier One – High Impact Potential	Tier Two – Moderate Impact Potential	Tier Three – Low Impact Potential
PG1 LTL 168 (ILI)	MAC LTL 168 (ILI)	BCF LTL 168 (PLR)
KA1 LTL 168 (PLR)	MAC LOP 168 (ILI)	PG3 LTL 219 (PRS)
KA1 LOP 168 (PLR)	CAR LTL 168 (PLR)	NWP LTL 168 (PRS)
SAL LOP 168 (ILI)	SA3 LTL 168 (PLR)	NWP LOP 219 (PRS)
FRD LTL 219 168 (ILI)	KE1 LOP 219 (PRS)	PG2 219 168 (PRS)
CRK LTL 168 (ILI)		WIL LP1/LP2 168 (PRS)
CRK LOP 219 (ILI)		COL LTL 219 (PRS)
CRK LP2 219 (ILI)		COL LOP 168 (PRS)
CRK LOP 273(ILI)		TRA LTL 168 (PRS)
KBY LTL 168 (ILI)		CEL LTL 168 (PRS)
SSK LTL 219 (ILI)		CAS NEL 168 (PRS)
		PGP LTL 168 (PRS)
		HUS LTL 168 (PRS)
		ELK LTL 168 (PRS)

COMMUNITY ENGAGEMENT

Approach

Community engagement will be aimed at maintaining positive relationships with those most impacted by the Project by keeping them informed. The following strategies have been identified, which will be adopted for each lateral during the development phase of the Project:

- **Tier One Strategies:**
  - Industrial customer engagement (ie. Meetings, emails, phone calls)
  - Notification letter to directly impacted land owners
  - Stakeholder information sessions/presentations for highest impact potential laterals
  - Stakeholder meetings
- **Tier Two Strategies:**
  - Industrial customer engagement (ie. Meetings, emails, phone calls)
  - Notification letter to directly impacted land owners
  - Stakeholder meetings
- **Tier Three Strategies:**
  - Industrial customer engagement (ie. Meetings, emails, phone calls)
  - Notification letter to directly impacted land owners
  - Stakeholder meetings, only if requested.

Each of the strategies listed above will allow opportunity for two-way communications, opportunity for stakeholders to provide us with feedback, and will be an iterative process.

Details of Strategies

Meetings/presentations with key stakeholders

- Maintain communications channels and regularly share information with municipal staff, their staff as appropriate
- This includes presentations at key municipal conferences, as well as meetings with an directly impacted landowners and/or businesses

Notifications

- Initial letters to be sent out to those that will be directly impacted by the Project, most specifically to those landowners that have gas lines running through their properties
- Follow up phone calls and emails to provide up-to-date Project information to key stakeholders, as more information becomes known (ie. schedule)

Community open Houses / information sessions

- We will offer to host some open houses and/or information sessions/coffee chats in those communities with the highest risk potential (Kamloops, for example)

Permitting & Municipal agreements

- Help facilitate and provide support in securing necessary municipal and OGC permits for the Project, as these discussions will typically begin prior to Project approval.

INDIGENOUS RELATIONS

Approach

FEI is committed to developing and maintaining relationships with Indigenous Communities within whose territories we operate. In keeping with FEI's statement of Aboriginal principles, the Project team intends to:

- **Uphold a high standard of consultation and engagement**—by acting proactively, responsively, and transparently—in order to maintain and grow our relationships with Indigenous communities affected by the Project, minimize legal risk, and sustain the FEI reputation. This will be achieved through early meetings with potentially affected communities to open a dialogue, introduce to the Project, share available information and provide timelines for ongoing engagement.
- Design and deliver **a tailored Community Investment initiative** related to the Project's impacts and/or location. This will be determined by the nature of the impacts associated with each lateral.
- Develop and deliver an **Indigenous procurement & employment plan**, which ensures all local Indigenous communities and individuals receive opportunities through the development of the Project. The Project team secured local indigenous business participation to inform the CPCN through contractor Stantec and subcontractor Tipi Mountain, an indigenous owned business associated with the Ktunaxa Nation.

Future Consultation Efforts

To ensure ongoing, meaningful engagement with Indigenous Communities as the Project progresses, the Project team will continue to participate in engagement meetings as requested by Indigenous Communities. In addition, the Project team will attend a number of local Indigenous events to support local communities.

COMMUNICATIONS

Approach

Communications will be consistent, open and transparent to all stakeholder and rights holders and will be scaled based on the level of impact. The goals of communication will be to support the engagement led by the Community Relations prior to filing and, if approved, throughout construction and at the various stages of the Project to ensure timely and accurate information is provided to stakeholder and rights holders. We will also communicate the ways in which the Project illustrates FEI's corporate values of safety, environmental commitment, customer value and community.

The Project team intends to:

- **Implement a proactive communications approach in a tone that is helpful and in plain language. Our communications will keep stakeholders and the public informed and engaged.**
    - Develop key messages and materials to educate stakeholders about the Project and address stakeholders' key concerns. Show our long-term interest in infrastructure in the province. Develop informational materials that explain the inspection methods and the potential of the upgrades.

- Establish the Project website as a vital link between the Project and the community. Include project maps, project milestones, and other resources, while encouraging stakeholders to use the website's feedback tools to share their comments and concerns directly. The FEI communications team will monitor the feedback tools and share with Community Relations.
- Develop a protocol with the Project team to address potential issues such as an upset Indigenous community, protests about work in sensitive areas, special interest groups upset about possible closure in back country recreational areas and property/business owner escalation
- Develop and promote stories about the community-facing benefits such as the socio-economic benefits such as hiring local businesses and offering community benefit projects.
- One ad placement in every community impacted by the Project (15 municipalities; nine regional districts) to notify of BCUC filing (takes place once CPCN is filed, and is prescribed by the BCUC

- **Drive participation in consultation opportunities to support the CPCN filing. Scale the communications by the identified tiers, based on the level of Project impact. Provide a clear call to action for our target audience to provide feedback and engage with us directly with any concerns.**
  - Encourage two-way communication that lets stakeholders know what feedback we are looking for and how we will use the information. Provide multiple ways for people to ask questions and provide feedback so that concerned stakeholders are confident they can work with us directly with the primary method being the feedback form on the web page and a dedicated email address.
  - Notify rate payers of potential rate increase through a bill insert, paid digital ads and corporate e-newsletters, and encourage customers to provide us with feedback on the project.
  - Most Project communications will target stakeholders with direct impacts, using one-to-one methods. If additional support is needed, we will deploy a promotional strategy using available communications channels (paid, earned and social), to drive participation in public consultation opportunities.
  - Develop event materials that clearly show the local impacts and our efforts to address them.

- **Develop ongoing communications channels to provide updates and work notifications to interested stakeholders, ensuring we are being empathetic, accurate and neighbourly in tone.**
  - Update the Project website with the latest information and stories as the project moves through approval stages.
  - Collect email addresses from interested stakeholders and send targeted updates as the project hits milestones. Consider any Privacy & Information Act requirements.
  - Issue a news release and web statement if the Project is approved.
  - Using appropriate channels for a given community, notify the public about work in their area that will have potential to disrupt to traffic or access to public areas

- Develop three feature stories (featuring our employees when possible) to illustrate FortisBC's corporate values with respect to Project planning. Promote these stories and the overall project messages through ongoing social media. Potential feature stories include how we conduct environmental assessments, our expertise and best practices when working in sensitive areas like heritage site and any related community investment.

KEY MESSAGES

We're planning upgrades to 29 natural gas lines in communities across B.C. that will enable us to continue providing the reliable service our customers count on now and well in to the future.

- The Inland Gas Upgrade is an extension of our existing system maintenance and monitoring operations.
- Some of the work will be to enable us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work.
- Some of this work will require us to upgrade lines to remove bends and small parts that could block inspection equipment. In some cases, this work will require us to replace gas lines. In other cases, we will regulate the pressure in sections of our system.
- The vast majority of this work will take place on existing right-of-ways.

The Inland Gas Upgrades represent a substantial investment into our natural gas system and reflects our long-term commitment to B.C.

- FortisBC, through its predecessors, has safely operated natural gas infrastructure in these regions B.C. for more than 60 years, and we're proud of our service to these communities where we also live and work.
- We are committed to working together with local municipalities, Indigenous communities, residents, and businesses to keep them informed.

Right now we're in the early planning stages of the Inland Gas Upgrades. The next step is to submit an application to our regulator – the BC Utilities Commission (BCUC), which will take place later this year.

- If approved, we expect the construction work will take place, section-by-section, between 2020 and 2025.
- We encourage anyone interested in learning more to email us at InlandGasUpgrades@fortisbc.com, follow us at talkingenergy.ca/inlandgasupgrades, or call **1-888-224-2710**.

Appendix A – List of Identified Stakeholders

1. Residents, businesses, industrial customers and land owners that will be directly impacted by the project,
2. All FEI natural gas customers impacted by rate increase.
3. Municipal and regional governments – Mayor, Council, City Manager and/or staff within the following municipalities and regional districts:
    a. Mackenzie
    b. Prince George
    c. Quesnel
    d. Williams Lake
    e. Kamloops
    f. Salmon Arm
    g. Vernon
    h. Kelowna
    i. Trail
    j. Castlegar
    k. Nelson
    l. Kimberley
    m. Cranbrook
    n. Elkford
    o. Sparwood
    p. Fraser-Fort George
    q. Cariboo
    r. Thompson-Nicola
    s. Columbia-Shuswap
    t. North Okanagan
    u. Central Okanagan
    v. Kootenay-Boundary
    w. Central Kootenay
    x. East Kootenay

Appendix B – List of Identified Right's Holders

- Okanagan Nation Alliance
- Secwepemc (Shuswap) Nation Tribal Council
- Ktunaxa Nation
- Nlaka'pamux Nations Tribal Council
- Tsilhqot'in National Government
- Treaty 8 First Nations
- Carrier Chilcotin Tribal Council
- Nicola Tribal Association Adams Lake Indian Band
- Akisqnuk First Nation
- Boothroyd Indian Band
- Coldwater Indian Band
- Doig River First Nation
- Esh-kn-am cultural Resources/ Cook's Ferry Indian Band
- Halfway River First Nation
- Lheidli T'enneh First Nation
- Lhtako Dene Nation
- Little Shuswap Indian Band
- Lower Kootenay Band
- Lower Nicola Indian Band
- Lower Similkameen Indian Band
- Lytton First Nation
- McLeod Lake Indian Band
- Metis Nation BC
- Nazko First Nation
- Neskonlith Indian Band
- Nooaitch Indian Band
- Okanagan Indian Band
- Oregon Jack Creek Indian Band
- Osoyoos Indian Band
- Penticton Indian Band
- Secwepemc RFA
- Shuswap Indian Band
- Siska Indian Band
- Skeetchestn Indian Band
- Skuppah Indian Band
- Splats'in First Nation
- Spuzzum First Nation
- St. Mary's Indian Band
- Stk'emlupsemc te Secwepemc Nation (SSN)
- Tk'emlups Band
- Tobacco Plains Indian Band
- Upper Nicola Indian Band
- West Moberly First Nation

Appendix Q-2

INDUSTRIAL CUSTOMERS NOTIFICATION

FortisBC Inc.
1975 Springfield Road
Kelowna, BC V1Y 7V7
www.fortisbc.com

July 20, 2018

«Owner_Name»
«Address»
«City», «Prov» «Postal»

RE: FortisBC Inland Gas Upgrade Projects

FortisBC would like to notify «Owner_Name» of a potential upgrade project where we're planning improvements to 29 natural gas lines in communities across B.C as part of our Inland Gas Upgrade Project.

The majority of the upgrades will be to enable us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work. Some of this work will require us to replace gas lines or fittings, where in other locations, we will regulate the pressure in some sections of our system.

The vast majority of this work will take place on existing right-of-ways. In some locations, FortisBC plans to excavate at various locations along each section route to perform the planned maintenance. In other areas, work will be limited to mechanical improvements within our existing stations. Property owned by «Owner_Name» in the communities of «Communities» have been identified along FortisBC right-of-ways.

FortisBC still requires approval for this project from the British Columbia Utilities Commission, and is planning to apply for a Certificate of Public Convenience and Necessity (CPCN). We are hoping to submit this CPCN to the Commission in September 2018. If the application is approved, we estimate that construction could begin in early 2021 with a projected completion time line of late 2025.

It's important to us that we work with landowners to identify any concerns and to answer questions. If you have questions, or if you'd like to be kept updated on the project progress, we encourage you to visit talkingenergy.ca/inlandgasupgrades or to email us at InlandGasUpgades@fortisbc.com.

At FortisBC, looking after infrastructure is part of our Integrity Management Program ensuring safe operation of our natural gas system for all customers. This project, combined with ongoing inspection and maintenance activities, will enable us to keep providing you the energy you have come to expect for many more years to come.

Sincerely,

Shelley Thomson
Community & Indigenous Relations Manager

cc. «KAM»

Appendix Q-3

LANDOWNER NOTIFICATION

FortisBC Inc.
1975 Springfield Road
Kelowna, BC V1Y 7V7
www.fortisbc.com

June 15, 2018

Owner Name & Address
Address
City, BC Postal code

RE: FortisBC Inland Gas Upgrade Project

Dear Owner Name & Address:

FortisBC would like to notify you of a potential upgrade project that may occur in your community. We're planning upgrades to 29 natural gas lines in communities across B.C as part of our Inland Gas Upgrade Project. The majority of the work will enable us to inspect the inside of gas lines using up-to-date inspection equipment.

This inspection method provides detailed information about the condition of each line, allowing us to better plan and manage maintenance work. Some of this work will require us to replace gas lines or fittings, while in other cases we will install measures to regulate the pressure of our system. In some areas, FortisBC plans to excavate at different locations along each section to perform the planned maintenance. In other locations, work will be limited to mechanical improvements within our existing stations.

The vast majority of operations will take place on existing right-of-ways. As part of our project evaluation, we have engaged Stantec Consulting to complete Archeological Assessments and Hemmera Consulting to complete Environmental Assessments for each of the proposed locations. In the coming weeks, you may be contacted if access to our Right of Way on your property is required. If they have already contacted you, we thank you for your cooperation and assistance.

For properties situated within the jurisdiction of the Agricultural Land Reserve, an application for approval will be made to the Agricultural Land Commission.

FortisBC still requires approval for this project from the British Columbia Utilities Commission (BCUC), and is planning to apply for a Certificate of Public Convenience and Necessity (CPCN) in September 2018. If the application is approved, we expect the construction work will take place, section-by-section, between 2020 and 2025.

At FortisBC, looking after infrastructure is part of our Integrity Management Program ensuring safe operation of our natural gas system for all customers. This project, combined with ongoing inspection and maintenance activities, will enable us to keep providing you the energy you have come to expect for many more years to come.

It's important to us that we work with landowners to identify any concerns and to answer questions. If you have questions, or if you'd like to be kept updated on the project progress, we encourage you to visit talkingenergy.ca/inlandgasupgrades or to email us at InlandGasUpgades@fortisbc.com.

Sincerely,

Shelley Thomson
Community & Indigenous Relations Manager

Appendix Q-4

STAKEHOLDER PRESENTATION

Inland Gas Upgrade Project

Southern Interior Local Government Association Conference 2018

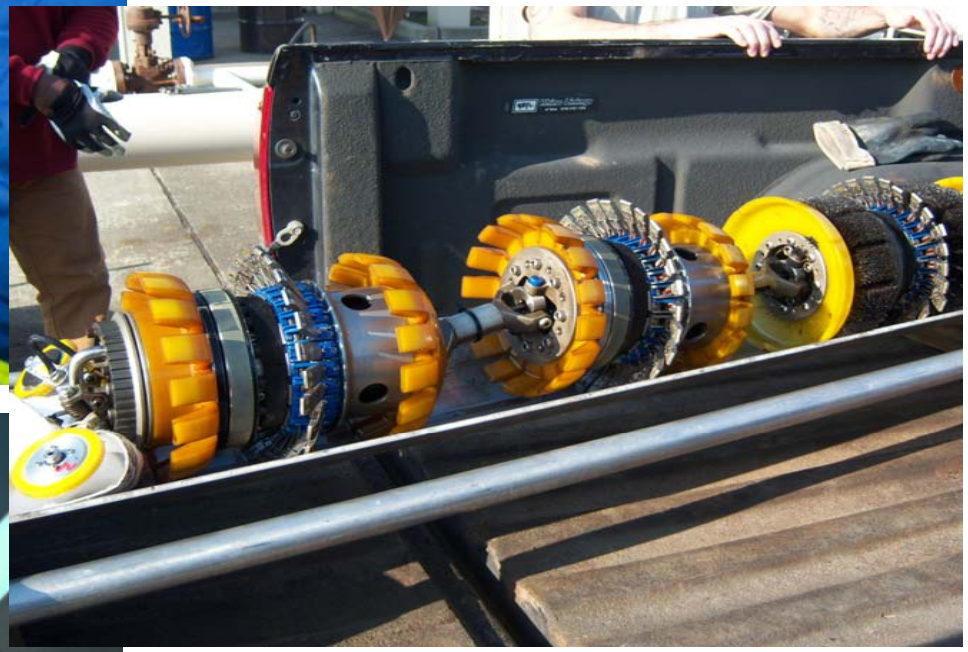
Shelley Thomson
Community & Indigenous Relations Manager

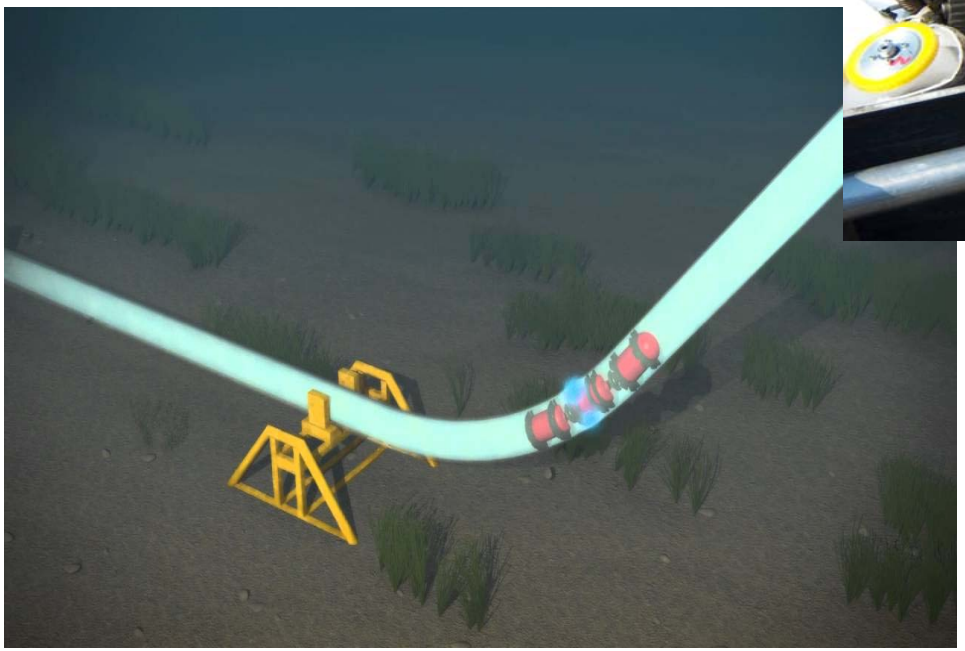
Energy at work FORTIS BC™

Overview

Upgrading our natural gas system to ensure our customers continue to receive the safe, reliable natural gas they count on now, and in the future.

Energy at work FORTIS BC™





Energy at work FORTIS BC™

Improvement Options

- Upgrades for In-Line Inspection
- Pipeline Replacement
- Pressure Regulating

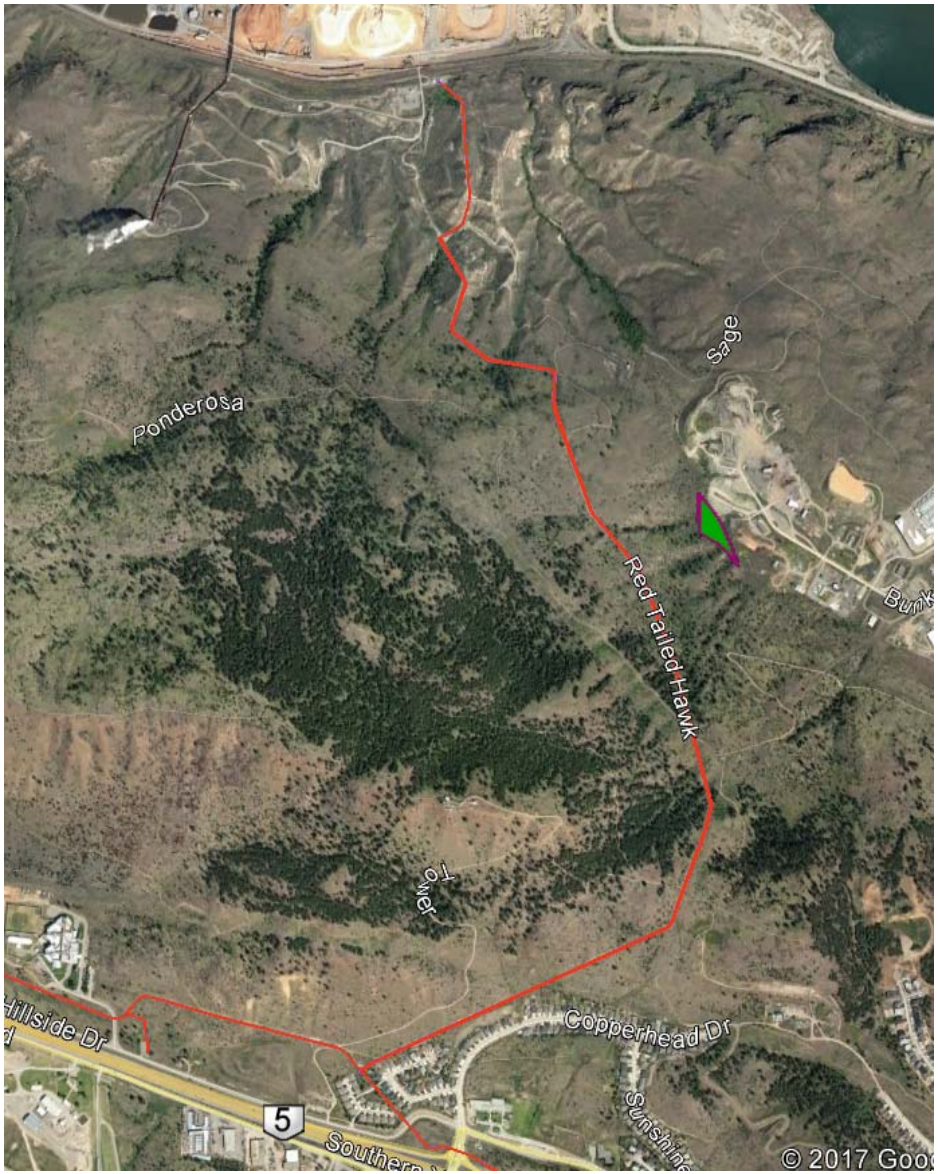
Energy at work FORTIS BC™

Project Timelines

Certificate of Public Convenience & Necessity (CPCN) Application Development	2017-2018
CPCN Application Submission	September 2018
CPCN Application Review	Q3 2019
Design & Engineering	Q4 2019-2020
BC Oil & Gas Commission (BCOGC) Permitting & Construction	2021-2025

Energy at work FORTIS BC™

Kamloops


Ponderosa
Sage
Red Tailed Hawk
Lower
Copperhead Dr
Hillside Dr
5
© 2017 Goo

Spallumcheen to Salmon Arm

Salmon Arm

Coldstream

Okanagan Ave
Shannon Rd
Allan Brooks Way
Upperton Rd
College Way
97
© 2017 Google

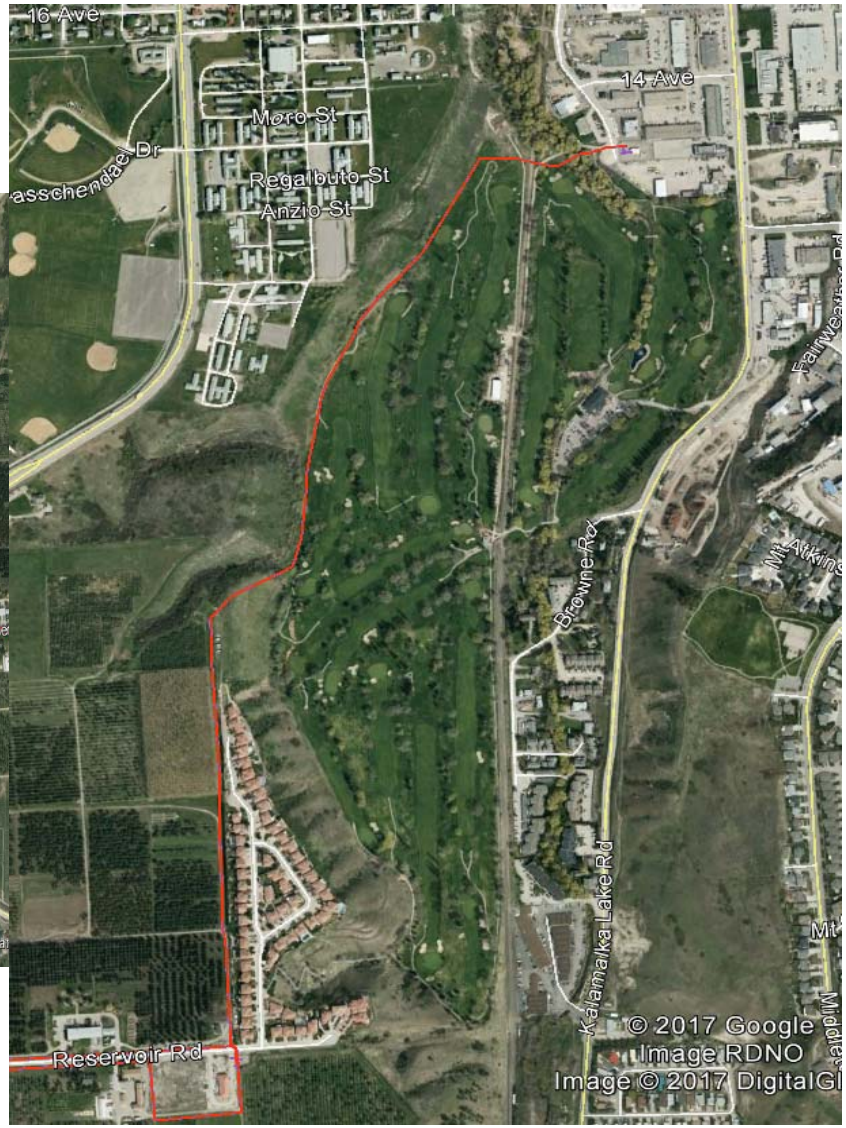

16 Ave
14 Ave
Moro St
Regalbuto St
Anzio St
Browne Rd
Kalamalka Lake Rd
Reservoir Rd
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Image © 2017 DigitalGl

Kelowna

Dilworth - Enterprise
Dilworth Dr
Bernard Ave
Rails with Trails
Leckie Pl
Leckie Rd
Hunter Rd
Hardy St
Enterprise Way
Enterprise Ct
© 2017 Google
Image City of Kelowna

Thank you

Energy at work FORTIS BC™

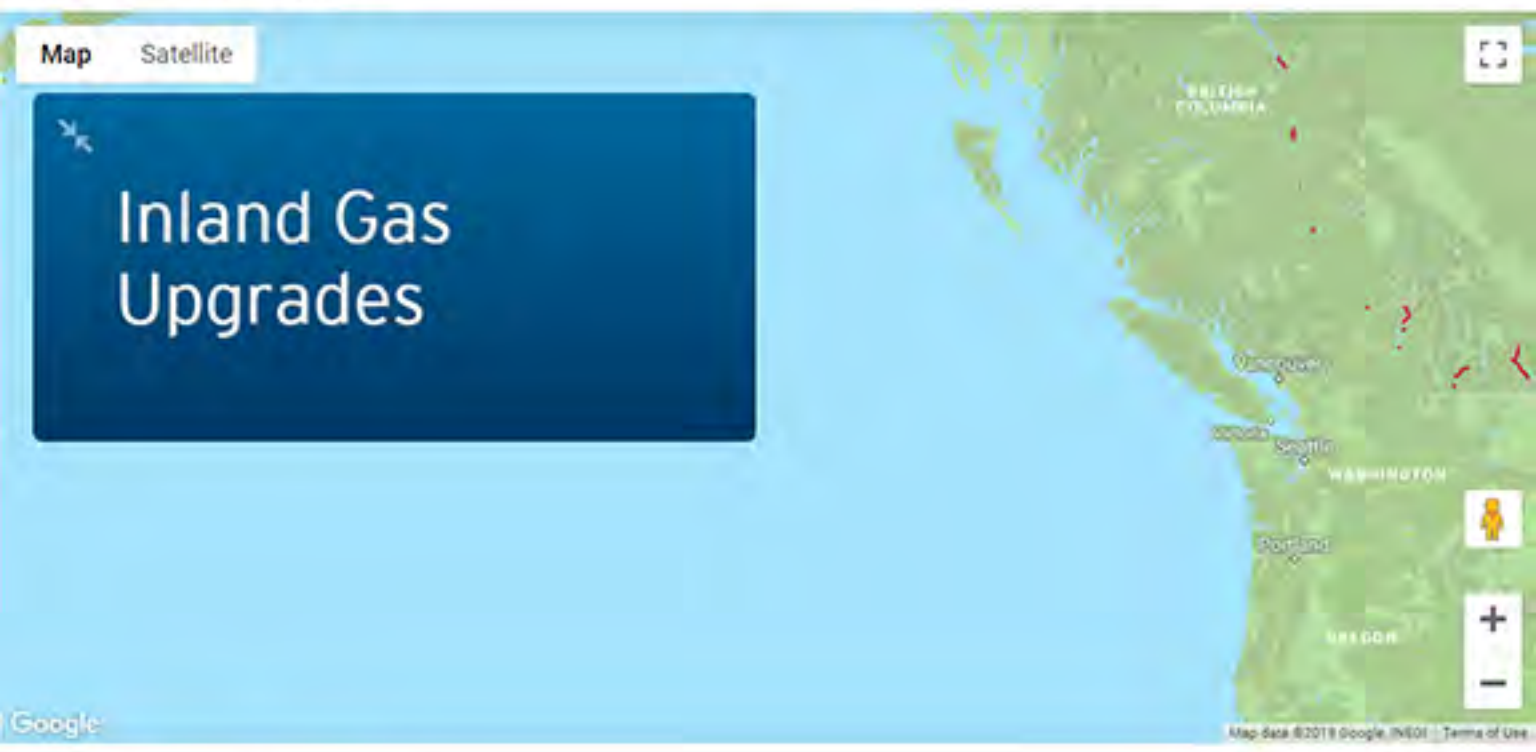
For further information,
please contact:

Shelley Thomson
Community & Indigenous Relations Manager
Shuswap-Nicola-Okanagan-Similkameen
Cell: 250.718.7041
Email: shelley.thomson@fortisbc.com

www.fortisbc.com

Appendix Q-5

INLAND WEBPAGE



About this project

We're planning to upgrade 29 sections of our existing natural gas lines located in communities in the Northern, Thompson-Okanagan, Cariboo and Kootenay regions of BC. As a result of these upgrades, we'll be able to use up-to-date inspection methods to monitor the line.

Why we're upgrading these lines

All of these lines have an excellent record for both safety and reliability, even the many that have been in operation since the 1950s. These upgrades, combined with our ongoing inspection and maintenance activities, will make sure these lines continue to provide safe, reliable service for many years to come. In many cases, these upgrades will allow us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work.

Work in your community

Some of this work will require us to upgrade lines to reduce bends and replace fittings that could block the in-line inspection equipment. In some cases, this work will require us to replace gas lines. In other cases, we will regulate the pressure in sections of our system. While the vast majority of this work will take place on existing rights of way, it could mean construction will take place in your community or surrounding areas. We are committed to engaging with communities we serve and keeping our customers informed during every step of this process.

Project timelines and next steps

Right now we're in the early planning stages. Our first step is to consult with communities and stakeholders who may be affected to let them know about potential projects in their area, get their feedback and address any initial questions. The next step is to submit an application to our regulator—the British Columbia Utilities Commission (BCUC). This will take place later in fall 2018. If approved, this upgrade will represent an approximate $200 to $300 million investment into our natural gas system; however, the project costs are still being finalized. At this time, we expect the average rate impacts over the course of the project to be minimal.

We expect the construction work will take place, section-by-section, between 2020 and 2025.

CALL US
1-855-576-7225

EMAIL US
inlandgasupgrades@fortisbc.com

ASK US
Ask a question

Related topics

09.21.16
How do we keep our natural gas lines safe?
SAFETY

09.21.16
Reflecting on 25 years of gas line safety
SAFETY

Stay in the loop

Learn about FortisBC related news, project updates and discussion topics.

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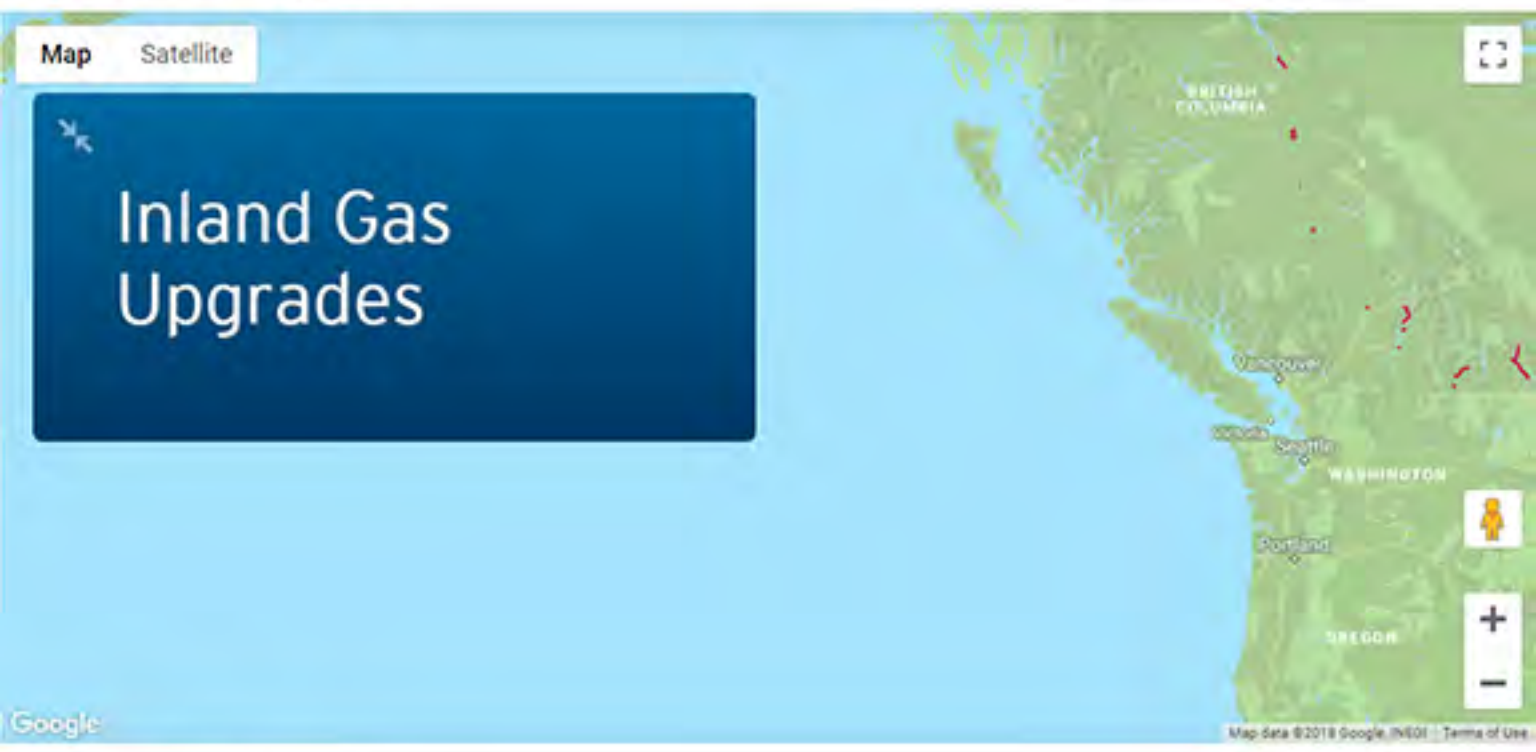

AUGUST 10, 2018

Dig a little, learn a lot

From now until the end of August, you may see crews working on behalf of FortisBC doing survey and small excavation

READ MORE

JUNE 15, 2018

Exploring rights of way for habitat and heritage

Native species, waterways and heritage sites—these are just a few of the reasons we work with certified professionals to

READ MORE

Receive updates on Inland Gas Upgrades

Enter your email below to get the latest news and alerts regarding this project.

EMAIL

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1-855-576-7225

EMAIL US
inlandgasupgrades@fortisbc.com

ASK US
Ask a question

Related topics

09.21.16

How do we keep our natural gas lines safe?

SAFETY

09.21.16

Reflecting on 25 years of gas line safety

SAFETY

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Learn about FortisBC related news, project updates and discussion topics.

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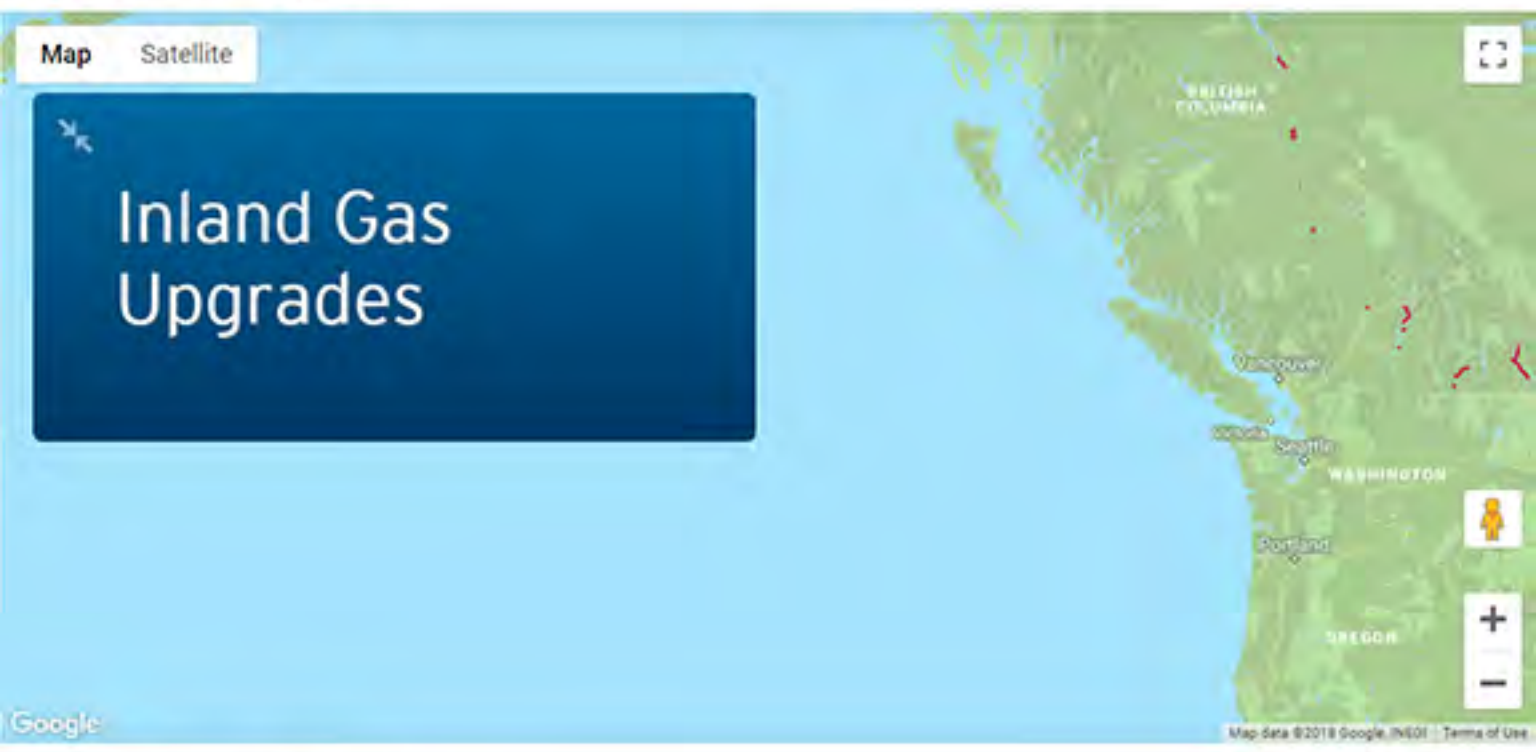

Communities where work will take place

The Inland Gas Upgrades could result in construction work in the following communities and their surrounding areas. The construction will be carefully planned, taking into account feedback from local stakeholders.

North

- Mackenzie

Cariboo

- Prince George
- Quesnel
- Williams Lake

Thompson-Okanagan

- Kamloops
- Salmon Arm
- Spallumcheen
- Armstrong
- Enderby
- Coldstream
- Kelowna

Kootenays

- Trail
- Castlegar
- Nelson
- Kimberley
- Cranbrook
- Elkford
- Sparwood

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Reflecting on 25 years of gas line safety

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Appendix Q-6

KEY MESSAGES INLAND GAS UPGRADES JULY 2018

KEY MESSAGES FINAL
INLAND GAS UPGRADES
JULY 2018

Project key messages

We're planning upgrades to 29 natural gas lines in communities across B.C. that will enable us to continue providing the reliable service our customers count on now and well in to the future.

- The Inland Gas Upgrade is an extension of our existing system maintenance and monitoring operations.
- The majority of the work will be to enable us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work.
- Some of this work will require us to upgrade lines to remove bends or fittings that could block inspection equipment. In some cases, this work will require us to replace gas lines. In other cases, we will regulate the pressure in sections of our system.
- The vast majority of this work will take place on existing right-of-ways.

The Inland Gas Upgrades represent a substantial investment into our natural gas system and reflects our long-term commitment to B.C.

- FortisBC, through its predecessors, has safely operated natural gas infrastructure in these regions B.C. for more than 60 years, and we're proud of our service to these communities where we also live and work.
- This upgrade will represent an approximate $200 to $300 million investment into our natural gas system; however the project costs are still being finalized. At this time, we expect the average rate impacts over the course of the project to be minimal.
- We are committed to working together with local municipalities, Indigenous communities, residents, and businesses to keep them informed.

Right now we're in the early planning stages of the Inland Gas Upgrades. The next step is to submit an application to our regulator – the BC Utilities Commission (BCUC), which will take place later this year.

- If approved, we expect the construction work will take place, section-by-section, between 2020 and 2025.
- We encourage anyone interested in learning more to email us at InlandGasUpgrades@fortisbc.com, follow us at **@fortisbc** or call **1-888-224-2710**.

Quick facts

- These lines are part of our Interior Transmission System that provides natural gas service to the interior of B.C. as far north as Mackenzie and into southern B.C. and the Kootenays.
- Many of these transmission lines have been in safe operation for as long as 60 years and these upgrades, combined with our ongoing inspection and maintenance activities, will enable these lines to continue providing safe, reliable service for many more years.

Supporting messages

Safety record

The FortisBC transmission and distribution pipeline system has an excellent safety record. This record is a direct result of our rigorous adherence to safe practices, and the diligence of our employees in carrying out our commitment to safety.

- We have rigorous safety standards in place to protect public safety and to ensure the ongoing integrity of our system. We also operate according to Canadian codes and our own high standards of operational excellence and safety.
- We review our system on an ongoing basis and each year we make significant investments in upgrading and replacing parts of our system in adherence to codes and standards, in addition to carrying out regular maintenance.
- We monitor our transmission system 24-hours a day, 365 days a year and conduct regular inspections to prevent any potential risk to our natural gas lines and take all possible steps to ensure our lines and surrounding areas are well-protected. In addition, we post signs to indicate the location of our transmission right of ways.
- Our employees take part in emergency response training exercises throughout the year in participation with local authorities, including police and fire departments.

About pigging

The preferred method is in-line inspection, often referred to as pigging, which is a smart-tool technology that allows us to perform inspections without having to stop the flow of natural gas to our customers.

- The in-line inspection tool, called a pigging tool, travels inside the line to collect detailed information about its condition, which allow us to better plan and manage maintenance work.
- We have been using this technology for 30 years to identify areas in our system that require further investigation or potential upgrades.
- Pigging technology has advanced to allow for high-quality in-line inspection of smaller diameter lines. This project includes segments ranging from 6 to 10".
- If pigging is the chosen inspection method, upgrades would include installing launching and receiving barrels on either end of the line and upgrading the line to remove any bends or fittings that could block the pigging equipment.

Protecting the environment

At FortisBC, we are responsible in all of our operations and work to reduce our impact to the environment and sensitive areas.

- While most work is expected to take place on existing right-of-ways, we are carefully assessing potential construction zones for sensitive habitat and other environmental concerns.
- We will develop a robust Environmental Management Plan (EMP) that must be followed whenever construction work takes place.

- We ensure all appropriate environmental permits are in place and follow all of the requirements of the B.C. Environmental Assessment Office and the BC Oil and Gas Commission.

Protecting heritage

Working closely with Indigenous communities, we will carefully assess potential construction zones for historic and archaeological sites.

- We respect the rights of Indigenous Peoples in their traditional territory and commit to obtaining the free, prior and informed consent of Indigenous Peoples before proceeding with projects.
- We are completing an archeological impact assessment for the proposed project, and will mitigate any potential adverse effects on heritage resources.
- We will have qualified Archeological Monitors onsite during any construction work that requires ground disturbance in areas that may contain archeological artifacts. When possible, we will hire these monitors from local communities.
- We follow all of the requirements with the guidance and approval of the B.C. Archeological Branch and the BC Oil and Gas Commission.

About rate impacts

We are currently evaluating the potential impact to delivery rates, which will form part of our regulatory application to the BC Utilities Commission.

- As with all infrastructure projects, we pay for the system upgrades and then recover the cost from all customers over the expected life of the gas line.
- For with any significant improvement to our natural gas system, we submit the costs of this project to the BCUC Utilities Commission for review and approval.
- At this time we expect the average rate impacts over the course of the project to be minimal.
- During the BC Utilities Commission's review process, you can register to participate at bcuc.com.

Related messages

- Natural Gas Pipeline Safety and Integrity

Appendix Q-7

INLAND PROJECT AWARENESS

Energy at work FORTIS BC

We're investing in our system

Inland Gas Upgrades

Learn more

Energy at work FORTIS BC™

Improving our natural gas system

We're planning upgrades to 29 natural gas lines including one in your community. This work will make sure our customers continue to receive the natural gas they count on, now—and in the future.

We're applying to the BC Utilities Commission this fall for approval to move forward. At this time, we expect the average rate impacts over the course of the project to be minimal.

To learn more, visit **talkingenergy.ca/inland** or contact us at **inlandgasupgrades@fortisbc.com** or **1-888-224-2710**.

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Appendix Q-8

BILL INSERT SEPTEMBER 2018

Energy at work

FORTIS BC™

Improving our natural gas system

Inland Gas Upgrades

18-137.14_Inland_September_Bill_Insert-PRESS.indd 1 8/10/2018 10:05:30 AM

We're planning upgrades to 29 natural gas lines in communities across B.C. The upgrades will make sure our customers continue to receive the safe and reliable service they count on, now—and in the future.

The majority of the planned work will occur on existing rights of way. It will include upgrading or replacing existing gas lines, which will enable us to inspect the inside of the gas lines with the most up-to-date technology, or allow us to regulate the pressure of the line.

We'll apply to the British Columbia Utilities Commission (BCUC) for the necessary approval in the fall.

If approved, this upgrade would represent a significant investment in our natural gas system and construction would start in 2020. At this time, we expect the average rate impacts over the course of the project to be minimal.

We encourage you to learn more and provide feedback. Visit **talkingenergy.ca/inland**.

To learn about the BCUC regulatory process, visit **bcuc.com**.

Connect with us

FORTIS BC™

Energy at work

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(18-137.14 07/2018) *MCC# 903354*

Appendix Q-9

INLAND ONLINE AD

We're investing in our system

Inland Gas Upgrades planning is underway.

Learn more

Appendix R

FIRST NATIONS ENGAGEMENT

Appendix R-1

SOE REPORTS

SOE Report

Report Name: Report
Report Date: Mon Apr 30 15:58:35 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

Mackenzie LTL
BCF LTL

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Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	West Moberly First Nations
Contact Address	PO Box 90
Contact City	Moberly Lake
Contact Province	BC
Contact Postal Code	V0C 1X0
Contact Phone	250-788-3663
Contact Fax	250-788-9792
Contact Email	admin@westmoberly.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Halfway River First Nation
Contact Address	PO BOX 59
Contact City	Wonowon
Contact Province	BC
Contact Postal Code	V0C 2N0
Contact Phone	250-772-5058
Contact Fax	250-772-5200
Contact Email	

Contact Name	
Contact Title	Chief and Council
Contact Organization	Doig River First Nation
Contact Address	PO Box 56
Contact City	Rose Prairie
Contact Province	BC
Contact Postal Code	V0C 2H0
Contact Phone	250-827-3776
Contact Fax	250-827-3778
Contact Email	

Contact Name	
Contact Title	Chief and Council
Contact Organization	McLeod Lake Indian Band
Contact Address	61 Sekani Drive
Contact City	McLeod Lake
Contact Province	BC
Contact Postal Code	V0J 2G0

Contact Phone	250-750-4415
Contact Fax	250-750-4420
Contact Email	

Contact Name	
Contact Title	Chief and Council
Contact Organization	Blueberry River First Nations
Contact Address	PO Box 3009
Contact City	Buick Creek
Contact Province	BC
Contact Postal Code	V0C 2R0
Contact Phone	250-630-2584
Contact Fax	250-630-2588
Contact Email	reception@blueberryfn.com

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SOE Report

Prince George LTL's

Report Name: Report
Report Date: Mon Apr 30 15:22:16 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

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Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nak'azdli Band
Contact Address	PO Box 1329 , Nakazdli Reserve
Contact City	Fort St James
Contact Province	BC
Contact Postal Code	V0J 1P0
Contact Phone	250-996-7171
Contact Fax	250-996-8010
Contact Email	nakazdli@nakazdli.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Carrier Chilcotin Tribal Council
Contact Address	59 South 1st Avenue
Contact City	Williams Lake
Contact Province	BC
Contact Postal Code	V2G 1H4
Contact Phone	250-398-7033
Contact Fax	250-398-6329
Contact Email	

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nazko First Nation
Contact Address	469 B Anderson Drive
Contact City	Quesnel
Contact Province	BC
Contact Postal Code	V2J 5J4
Contact Phone	250-992-9085
Contact Fax	250-992-7982
Contact Email	admin@nazkoband.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lheidli-T'enneh Band
Contact Address	1041 Whenun Rd
Contact City	Prince George
Contact Province	BC
Contact Postal Code	V2K 5X8

Contact Phone	250-963-8451
Contact Fax	250-963-6954
Contact Email	

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SOE Report

KAM LTL/ LOP

Report Name: Report
Report Date: Mon Apr 30 15:08:09 PDT 2018
Shape Name: unnamed
Adjacency Buffer: This feature was not buffered.

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	250-378-6141
Contact Fax	250-378-3699
Contact Email	reception@nooaitch.com

Contact Name	Brenda Walkem
Contact Title	
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	c-o Sharon Clayton-Parsons, Esh-kn-am Cultural Resources Management Services, #311-230th St., Coldwater IR, 1PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-458-2224
Contact Fax	250-315-0084
Contact Email	eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Siska Indian Band
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC

Contact Postal Code	V0K 1Z0
Contact Phone	250-455-2219
Contact Fax	250-455-2539
Contact Email	siskaib@lyttonbc.net

Contact Name	c/o Sharon Clayton-Parsons - Esh-kn-am Cultural Resources Management Services
Contact Title	
Contact Organization	Cook's Ferry Indian Band
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-458-2224
Contact Fax	250-458-2312
Contact Email	eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-378-6174
Contact Fax	250-378-5351
Contact Email	lantoine@coldwaterband.org AND eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Indian Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	250-453-9098
Contact Fax	250-453-9097
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council
Contact Address	PO Box 430
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	250) 455-2711
Contact Fax	250) 455-2565
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nicola Tribal Association
Contact Address	PO Box 188 Stn Main
Contact City	Merritt

Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250) 378-4235
Contact Fax	250) 378-9119
Contact Email	administration@nta.nicolatribal.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	250-378-5157
Contact Fax	250-378-6188
Contact Email	tluc@lnib.net and cc tluc@lnib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	250-455-2304
Contact Fax	250-455-2291
Contact Email	nntc.referrals@nntc.ca and cc Pauline@lyttonfirstnations.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	VOK 2S1
Contact Phone	604-863-2395
Contact Fax	604-863-2218
Contact Email	nntc.referrals@nntc.ca and cc jjohnson@spuzzumnation.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	PO Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	VOK 2S1
Contact Phone	250-455-2279
Contact Fax	250-455-2772
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70

Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	604-867-9211
Contact Fax	604-867-9747
Contact Email	nntc.referrals@nntc.ca and cc boothroyd@gmail.com

Contact Name	Greg Blain
Contact Title	Chief and Council
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	250-453-9154
Contact Fax	250-453-9156
Contact Email	gblain43715@yahoo.ca

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups Band
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9700
Contact Fax	250-372-8833
Contact Email	referrals@kib.ca

Contact Name	Travis Marr
Contact Title	Referrals Coordinator
Contact Organization	Stk'emlupsemc te Secwepemc Nation (SSN)
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	250-373-0023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca

Contact Name	Mike Anderson
Contact Title	
Contact Organization	Skeetchestn Indian Band

Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	250-373-2493
Contact Fax	250-373-2494
Contact Email	referrals@skeetchestn.ca

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SOE Report

Report Name: Report
Report Date: Mon Apr 30 15:04:08 PDT 2018
Shape Name: unnamed
Adjacency Buffer: This feature was not buffered.

WIL LTL

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Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Williams Lake Indian Band
Contact Address	2672 Indian Drive
Contact City	Williams Lake
Contact Province	BC
Contact Postal Code	V2G5K9
Contact Phone	250-296-3507
Contact Fax	250-296-4750
Contact Email	

Contact Name	
Contact Title	Chief and Council
Contact Organization	Xats'ull First Nation
Contact Address	3405 Mountain House Road
Contact City	Williams Lake BC
Contact Province	BC
Contact Postal Code	V2G 5L5
Contact Phone	250-989-2323
Contact Fax	250-989-2300
Contact Email	admin@xatsull.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Northern Secwepemc Tribal Council
Contact Address	17 South First Aveenue
Contact City	Williams Lake
Contact Province	BC
Contact Postal Code	V2G 1H4
Contact Phone	250-392-7361
Contact Fax	250-392-6158

Contact Email	administration @nstq.org

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SOE Report

Report Name: Report

Report Date: Tue Jul 25 09:36:36 PDT 2017

Shape Name: unnamed

Adjacency Buffer: This feature was not buffered.

KAM LTL/ LOP

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	250-378-6141
Contact Fax	250-378-3699
Contact Email	reception@nooaitch.com

Contact Name	Brenda Walkem
Contact Title	
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	c-o Sharon Clayton-Parsons, Esh-kn-am Cultural Resources Management Services, #311-230th St., Coldwater IR, 1PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-458-2224
Contact Fax	250-315-0084
Contact Email	eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	604-867-9211
Contact Fax	604-867-9747
Contact Email	nntc.referrals@nntc.ca and cc boothroyd@gmail.com

Contact Name	

Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	VOK 2S1
Contact Phone	604-863-2395
Contact Fax	604-863-2218
Contact Email	nntc.referrals@nntc.ca and cc jjohnson@spuzzumnation.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	PO Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	VOK 2S1
Contact Phone	250-455-2279
Contact Fax	250-455-2772
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council
Contact Address	PO Box 430
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	250) 455-2711
Contact Fax	250) 455-2565
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nicola Tribal Association
Contact Address	PO Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250) 378-4235
Contact Fax	250) 378-9119
Contact Email	administration@nta.nicolatribal.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	250-378-5157
Contact Fax	250-378-6188
Contact Email	tluc@lnib.net and cc tluc@lnib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	250-455-2304
Contact Fax	250-455-2291
Contact Email	nntc.referrals@nntc.ca and cc Pauline@lyttonfirstnations.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Siska Indian Band
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	250-455-2219
Contact Fax	250-455-2539
Contact Email	siskaib@lyttonbc.net

Contact Name	c/o Sharon Clayton-Parsons - Esh-kn-am Cultural Resources Management Services
Contact Title	
Contact Organization	Cook's Ferry Indian Band
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-458-2224
Contact Fax	250-458-2312
Contact Email	eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-378-6174
Contact Fax	250-378-5351
Contact Email	lantoine@coldwaterband.org AND eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Indian Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	250-453-9098
Contact Fax	250-453-9097
Contact Email	nntc.referrals@nntc.ca

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	Mike Anderson
Contact Title	
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	250-373-2493

Contact Fax	250-373-2494
Contact Email	referrals@skeetchestn.ca

Contact Name	
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups Band
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9700
Contact Fax	250-372-8833
Contact Email	referrals@kib.ca

Contact Name	Travis Marr
Contact Title	Referrals Coordinator
Contact Organization	Stk'emlupsemc te Secwepemc Nation (SSN)
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	250-373-0023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Consultative Areas Database (CAD) Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: Report
Report Date: Tue May 01 13:20:09 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

SAL LOP (Salmon Arm to Enderby section)

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7

Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0
Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-8841
Contact Fax	250-679-8813
Contact Email	referrals@alib.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Little Shuswap Indian Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC

Contact Postal Code	VOE 1MZ
Contact Phone	250-679-3203
Contact Fax	250-679-3220
Contact Email	sadamson@lslib.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Splats'in First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	250-838-6496
Contact Fax	250-838-2131
Contact Email	ray_cormier@splatsin.ca

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: Report
Report Date: Tue May 01 13:17:29 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

SAL LOP (Enderby to Armstrong section)

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7

Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0
Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-8841
Contact Fax	250-679-8813
Contact Email	referrals@alib.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Little Shuswap Indian Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC

Contact Postal Code	VOE 1MZ
Contact Phone	250-679-3203
Contact Fax	250-679-3220
Contact Email	sadamson@lslib.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Splats'in First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	250-838-6496
Contact Fax	250-838-2131
Contact Email	ray_cormier@splatsin.ca

Layers Queried Successfully:

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SOE Report

Report Name: Report
Report Date: Tue May 01 13:22:28 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

SAL LOP (Armstrong to Spallumcheen)

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	250-679-8841
Contact Fax	250-679-8813
Contact Email	referrals@alib.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Little Shuswap Indian Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	VOE 1MZ
Contact Phone	250-679-3203
Contact Fax	250-679-3220
Contact Email	sadamson@lslib.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Splats'in First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	250-838-6496
Contact Fax	250-838-2131
Contact Email	ray_cormier@splatsin.ca

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: Report
Report Date: Tue May 01 12:52:28 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

COL LTL/ LOP

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8

Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0
Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Splats'in First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	250-838-6496
Contact Fax	250-838-2131
Contact Email	ray_cormier@splatsin.ca

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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The Consultative Areas Database (CAD) Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

KEL 1 LTL

Report Name: Report
Report Date: Tue May 01 12:48:51 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	250-769-4999
Contact Fax	250-769-2443
Contact Email	referrals@wfn.ca

Contact Name	Brenda Walkem
Contact Title	
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	c-o Sharon Clayton-Parsons, Esh-kn-am Cultural Resources Management Services, #311-230th St., Coldwater IR, 1PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-458-2224
Contact Fax	250-315-0084
Contact Email	eshknam.arch@gmail.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	250-378-6141
Contact Fax	250-378-3699
Contact Email	reception@nooaitch.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank

Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0
Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Layers Queried Successfully:

SOE Report

TRA LTL

Report Name: Report
Report Date: Mon Apr 30 16:18:01 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	250-498-3444
Contact Fax	250-498-6577
Contact Email	referrals@oib.ca

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0
Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7

Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Splats'in First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	250-838-6496
Contact Fax	250-838-2131
Contact Email	ray_cormier@splatsin.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC

Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0
Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band
Contact Address	7470 Mission Road
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere

Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Contact Name	
Contact Title	
Contact Organization	
Contact Address	
Contact City	
Contact Province	
Contact Postal Code	
Contact Phone	
Contact Fax	
Contact Email	

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- Privacy:
  http://www.gov.bc.ca/com/privacy.html

SOE Report

Report Name: Report
Report Date: Mon Apr 30 16:06:12 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

CEL LTL
CAS-NEL LTL

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Chief and Council
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	250-498-3444
Contact Fax	250-498-6577
Contact Email	referrals@oib.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	250-679-3295
Contact Fax	250-679-5306
Contact Email	referrals@neskonlith.net

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	PO Box 100
Contact City	Keremeos
Contact Province	BC
Contact Postal Code	V0X 1N0

Contact Phone	250-499-5528
Contact Fax	250-499-5538
Contact Email	referrals.coordinator@lsib.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	250-493-0048
Contact Fax	250-493-2882
Contact Email	referrals@pib.ca

Contact Name	Christine Saddleman
Contact Title	Natural Resource Tech
Contact Organization	Upper Nicola Indian Band
Contact Address	PO Box 3700, 2225 Village Road
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	250-350-3342
Contact Fax	250-350-3311
Contact Email	nrtech1@uppernicola.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	250-707-0095
Contact Fax	250-707-0166
Contact Email	director@syilx.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	250-542-4328
Contact Fax	250-542-4990
Contact Email	okibreferrals@okanagan.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC

Contact Postal Code	V0E 1M0
Contact Phone	250-679-8841
Contact Fax	250-679-8813
Contact Email	referrals@alib.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0
Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band
Contact Address	7470 Mission Road
Contact City	Cranbrook

Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere
Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Contact Name	
Contact Title	
Contact Organization	
Contact Address	
Contact City	
Contact Province	
Contact Postal Code	
Contact Phone	
Contact Fax	
Contact Email	

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: Report
Report Date: Mon Apr 30 16:26:07 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

CRA LTL/ LOP
CRA KIM LTL/ LOP

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0

Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band
Contact Address	7470 Mission Road
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere
Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

KIM LTL

Report Name: Report
Report Date: Mon Apr 30 16:29:32 PDT 2018
Shape Name: unnamed
Linear Width: 5.0
Adjacency Buffer: This feature was not buffered.

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0

Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band
Contact Address	7470 Mission Road
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere
Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

FRD LTL

Report Name: Report
Report Date: Tue Jul 25 10:28:04 PDT 2017
Shape Name: unnamed
Adjacency Buffer: This feature was not buffered.

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0
Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band

Contact Address	7470 Mission Road
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere
Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

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- Warranty Disclaimer & Limitation of Liabilities: http://www.gov.bc.ca/com/disclaimer.html

SOE Report

Report Name: Report

Report Date: Tue Jul 25 10:29:05 PDT 2017

Shape Name: unnamed

Adjacency Buffer: This feature was not buffered.

FRD LTL

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	
Contact Title	Single Window Administrative Portal (SWAP)
Contact Organization	Secwepemc RFA
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	250-828-9761
Contact Fax	250-373-0025
Contact Email	Proponents disregard - Prov ONLY to refer through swapconnect.ca

Contact Name	Sierra Stump
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	250-341-3678
Contact Fax	250-342-2948
Contact Email	info@kinbasket.net

Contact Name	
Contact Title	Chief and Council
Contact Organization	Akisqnuk First Nation
Contact Address	PO Box 130
Contact City	Windermere
Contact Province	BC
Contact Postal Code	V0B 2L0
Contact Phone	250-342-6301
Contact Fax	250-342-9693
Contact Email	abergles@akisqnuk.org

Contact Name	
Contact Title	Chief and Council
Contact Organization	Lower Kootenay Band
Contact Address	830 Simon Road
Contact City	Creston
Contact Province	BC
Contact Postal Code	V0B 1G2
Contact Phone	250-428-4428
Contact Fax	250-428-7686
Contact Email	info@lowerkootenay.com

Contact Name	
Contact Title	Chief and Council
Contact Organization	St. Mary's Indian Band

Contact Address	7470 Mission Road
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-426-5717
Contact Fax	250-426-8935
Contact Email	smbadmin@cyberlink.bc.ca

Contact Name	
Contact Title	Chief and Council
Contact Organization	Tobacco Plains Indian Band
Contact Address	PO Box 76
Contact City	Grasmere
Contact Province	BC
Contact Postal Code	V0B 1R0
Contact Phone	250-887-3461
Contact Fax	250-887-3424
Contact Email	administration@tobaccoplains.org

Contact Name	
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	250-489-2464
Contact Fax	250-489-5760
Contact Email	info@ktunaxa.org

Layers Queried Successfully:

CAD contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Consultative Areas Database (CAD) Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. CAD Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

The information provided is not intended to create, recognize, limit or deny any aboriginal or treaty rights, including aboriginal title, that First Nations may have, or impose any obligations on the Province or alter the legal status of resources within the Province or the existing legal authority of British Columbia. The Province makes no warranties or representations regarding the accuracy, timeliness, completeness or fitness for use of any or all data provided in the reports.

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- Warranty Disclaimer & Limitation of Liabilities: http://www.gov.bc.ca/com/disclaimer.html

Appendix R-2

NOTIFICATION INLAND PROJECT

Shelley Thomson
Community & Aboriginal Relations

FortisBC Inc.
1975 Springfield Road
Kelowna, BC V1Y 7V7
Tel: 250-868-4525
shelley.thomson@fortisbc.com
www.fortisbc.com

May 7, 2018

First Nation
Address
City, BC Postal

Attention: *Contact* *Email*

Re: FortisBC Inland Gas Upgrade Program

FortisBC would like to notify *First Nation* of a potential upgrade project that may occur within your traditional territory.

We're planning upgrades to 29 natural gas lines in communities across B.C. The majority of the work will be to enable us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work. Some of this work will require us to replace gas lines or fittings. In other cases, we will regulate the pressure in some sections of our system. The vast majority of this work will take place on existing right-of-ways.

I have attached maps to show the natural gas line sections within your Territory that may be affected by the project. In some locations, FortisBC plans to excavate at various locations along each section route to perform the planned maintenance. In other locations, work will be limited to mechanical improvements within our existing stations.

We have asked Stantec Consulting to complete Archeological Assessments and Hemmera Consulting to complete Environmental Assessments for each of the proposed locations. In the coming weeks, Stantec and Hemerra may be contacting your community about the possibility of working together.

FortisBC values your input and knowledge of the traditional land use and cultural history you would be willing to share.

FortisBC still requires approval for this project from the British Columbia Utilities Commission, and is planning to apply for a Certificate of Public Convenience and Necessity (CPCN). We are hoping to submit this CPCN to the Commission in September 2018. If the application is approved, we estimate that construction could begin in early 2021 with a projected completion time line of late 2025.

If you have any questions regarding the project, please contact me directly at 250-868-4525 or by email at shelley.thomson@fortisbc.com. Additionally, if you would like to schedule a meeting to discuss in more detail, or to be kept informed of the project's progress please let me know.

Sincerely,

Shelley Thomson
Community & Aboriginal Relations Manager

attachment

Lateral(s)	CR Manager	Region	First Nation	Address	City	Postal	Contact	Email	CC	Email	CC	Email	Notes
Kamloops, Williams Lake, Spallumcheen, Salmon Arm (PLR), Castlegar-Nelson	Shelley	Shuswap	Adams Lake Indian Band	PO Box 588, Hillcrest Road	Chase	V0E 1M0	Iva Jules, Lands Manager	referrals@alib.ca					
Kamloops	Shelley	Nicola	Ashcroft Indian Band	PO Box 440	Ashcroft	V0K 1A0	Jodene Blain, Band Administrator	jodene@ashcroftband.ca					
Mackenzie	Matt	North	Blueberry River First Nations	PO Box 3009	Buick Creek	V0C 2R0	Merli de Guzman, Band Manager						Sent by Canada Post mail
Kamloops	Matt	Thompson	Bonaparte Indian Band	PO Box 669	Cache Creek	V0K 1H0	Kipp Fennell, Natural Resources Department	naturalresources@bonaparteindianband.com					
Kamloops	Matt	Thompson	Bonaparte Indian Band	PO Box 669	Cache Creek	V0K 1H0	Bert William, Cultural Resource Manager	culturalheritage@bonaparteindianband.com					
Kamloops	Matt	Central Interior	Boothroyd Band	PO BOX 70	Boston Bar	V0K 1C0	Terrie Davidson, Band Manager						Sent by Canada Post mail
Williams Lake	Matt	Central Interior	Canim Lake Band	PO Box 1030	100 Mile House	V0K 2E0	Don Dixon, B.A., Natural Resources Department	canimnr@canimlakeband.com					
Prince George, Quesnel	Matt	Central Interior	Carrier Chilcotin Tribal Council	59 South 1st Avenue	Williams Lake	V2G 1H4	Karen Kubiski, Land & Resource Officer	landandresources@carrierchilcotin.org					
Kamloops	Shelley	Nicola	Coldwater Indian Band	PO Box 4600, 2249 Quilchena Avenue	Merritt	V1K 1B8	Laura Antoine, Administrator	lantoine@coldwaterband.org					
Kamloops	Shelley	Nicola	Cook's Ferry Indian Band	#311-230 Street, Coldwater IR, 1PO Box 2159	Merritt	V1K 1B8	Referrals Committee	eshknam.arch@gmail.com					See Esh-kn-am Cultural Resources note below
Mackenzie	Matt	Northern	Doig River First Nation	PO BOX 56	Rose Prairie	V0C 2H0	Shona Nelson, Band Administrator	snelson@doigriverfn.com					Sent by Canada Post mail
Kamloops, Kelowna	Shelley	Nicola	Esh-kn-am Cultural Resources Management Services	#311-230 Street, Coldwater IR, 1PO Box 2159	Merritt	V1K 1B8	Referrals Committee	eshknam.arch@gmail.com	Paul Mitchell-Banks				Received email response - contact info changed to Referrals Committee
Mackenzie	Matt	Northern	Halfway River First Nation	PO BOX 59	Wonowon	V0C 2N0	Randy Orr, Band Manager	rorr@hrfn.ca					Sent by Canada Post mail
Castlegar-Nelson, Trail, Cranbrook, Kimberley, Elkford, Sparwood	Blair	Kootenay	Ktunaxa Nation Council	7825 Mission Road	Cranbrook	V1C 7E5	Kerri Garner	Kgarner@ktunaxa.org					
Prince George	Matt	North	Lheidli T'enneh First Nation	1041 Whenun Road	Prince George	V2K 5X8	Chus Natlo Sam, Natural Resources Referrals Officer	info@lheidli.ca					
Quesnel	Matt	Central Interior	Lhoosk'uz Dene Nation	PO Box 4639	Quesnel	V2J 3J8	Chief Liliane Squinas						Sent by Canada Post mail
Quesnel	Matt	Central Interior	Lhtako Dene First Nation	PO Box 4693, 1511 Arbutus Road	Quesnel	V2J 3J9	Chief Terry Boucher						Sent by Canada Post mail
Kamloops, Williams Lake, Spallumcheen, Salmon Arm (PLR)	Shelley	Shuswap	Little Shuswap Lake Indian Band	1886 Little Shuswap Lake Road	Chase	V0E 1MZ	Stewart Adamson, Lands & Resources Manager	sadamson@lslib.com					Email response received: Stewart Adamson no longer works for LSLIB. Please contact reception at LSLIB via phone at 1 250 679 3203 and the call will be directed to the appropriate party.
Kamloops	Shelley	Nicola	Lower Nicola Indian Band	181 Nawishaskin Lake	Merritt	V1K 0A7	Dave Caswell	tluc@lnib.net					
Kelowna, Coldstream, Spallumcheen, Castlegar-Nelson, Trail	Shelley	South Interior	Lower Similkameen Indian Band	PO Box 100	Keremeos	V0X 1N0	Joanne Dennis, Lands & Estates	landmember@lsib.net	Wendy Hawkes	referrals.coordinator@lsib.net	Nicole Mack	referralsclerk@lsib.net	
Kamloops	Matt	Nicola	Lytton First Nation	PO Box 20	Lytton	V0K 1Z0	Chief & Council	ChristinemBrown161@gmail.com					Sent by Canada Post mail
Mackenzie	Matt	Northern	McLeod Lake Indian Band	General Delivery	McLeod Lake	V0J 2G0	Alec Chingee, MLIB Land Management Contacts						Sent by Canada Post mail
Prince George	Matt	North	Nak'azdli Whut'en'	PO BOX 1329	Kamloops	V0J 1P0	Capital & Lands Manager	clmanager@nakazdli.ca					
Prince George	Matt	North	Nazko First Nation	469B Anderson Drive	Quesnel	V2J 5J4	Stuart Alec, Land & Resource Officer	stuartalec@nazkoband.ca					
Kamloops, Williams Lake, Spallumcheen, Salmon Arm (PLR), Castlegar-Nelson, Trail	Shelley	Shuswap	Neskonlith Indian Band	PO Box 318	Chase	V0E 1M0	Referrals Coordinator	referrals@neskonlith.net	Shane Vincenzi	shanevincenzi@skatsin.com			
Kamloops	Shelley	Nicola	Nicola Tribal Association	PO Box 188 Stn Main	Merritt	V1K 1B8	Arlene Johnston, Executive Director	email did not go through - administration@nta.nicolatribal.org					Email undeliverable
Kamloops	Matt	Nicola	Nlaka'pamux Nation Tribal Council	PO Box 430	Lytton	V0K 1Z0	Chief & Council						Sent by Canada Post mail
Kelowna, Kamloops	Shelley	Nicola	Nooaitch Indian Band	2954 Shackelly Road	Merritt	V1K 1N9	David Lawrence Bosnich, Lands Manager	email did not go through - david@nooaitch.com					Email undeliverable
Williams Lake	Matt	Central Interior	Northern Secwepemc Tribal Council	17 South First Avenue	Williams Lake	V2G 1H4	Band Administrator	administration@nstq.org					Sent by Canada Post mail
Kelowna, Coldstream, Spallumcheen, Salmon Arm (PLR), Castlegar-Nelson, Trail	Shelley	South Interior	Okanagan Indian Band	12420 Westside Road	Vernon	V1H 2A4	Colleen Marchand, Director of Territorial Stewardship	colleen.marchand@okanagan.org	Randy Marchand, Lands Supervisor	randy.marchand@okanagan.org	Julie Richards	Julie.richards@okanagan.org	
Kelowna, Coldstream, Spallumcheen. Castlegar-Nelson, Trail	Shelley	South Interior	Okanagan Nation Alliance	#101-3535 Old Okanagan Highway	Westbank	V4T 3L7	Lisa Wilson, Natural Resources Manager	nrmanager@syilx.org					
Kamloops	Shelley	Nicola	Oregon Jack Creek Indian Band	PO Box 940	Ashcroft	V0K 1A0	Chief & Council	nntc.referrals@nntc.ca					

Castlegar-Nelson, Trail, Celgar	Shelley	South Interior	Osoyoos Indian Band	1155 SenPokChin Blvd	Osoyoos	V0H 1T8	Yvonne Weinert, Lands Manager	YWeinert@oib.ca	Amanda Anderson	referrals@oib.ca	Yvonne Weinert	YWeinert@oib.ca	
Kelowna, Coldstream, Spallumcheen, Castlegar-Nelson, Trail, Celgar	Shelley	South Interior	Penticton Indian Band	RR2 Site 80 Comp 19	Penticton	V2A 6J7	James Pepper, Community & Environmental Services	JPepper@pib.ca	Dan Sarazin, Lands Manager	dsarazin@pib.ca			
Castlegar-Nelson, Trail, Cranbrook, Kimberley, Elkford, Sparwood	Blair	Shuswap	Shuswap Band	RR#2-3A 492 Arrow Road	Invermere	V0A 1K2	Diana Cote, Territorial Stewardship Manager/Intergovernmental Negotiations	lands@shuswapband.net					
Kamloops	Matt	Nicola	Siska Indian Band	PO Box 519	Lytton	V0K 1Z0	Trish Munroe, Administrator	sisaib@lyttonbc.net					Sent by Canada Post mail
Kamloops	Matt	Thompson	Skeetchestn Indian Band	PO Box 178	Savona	V0K 2J0	Mike Anderson	referrals@skeetchestn.ca					
Kamloops	Matt	Central Interior	Skuppah Indian Band	PO BOX 400	Lytton	V0K 1Z0	Referrals Department						Sent by Canada Post mail
Coldstream, Spallumcheen, Salmon Arm (PLR), Castlegar-Nelson, Celgar	Shelley	Shuswap	Splats'in First Nation	PO Box 460, 5775 Old Vernon Road	Enderby	V0E 1V0	Adam Neil, Environmental Monitor	Adam.neil@splatsindc.com					
Kamloops	Matt	Central Interior	Spuzzum First Nation	SITE 3, C-11, RR 1	Yale	V0K 2S0	Angie Mitchell, Land Use Coordinator	landmanagement@spuzzumnation.com					Sent by Canada Post mail
Kamloops	Matt	Thompson	Stk'emlupsemc te Secwepemc Nation (SSN)	PO Box 188	Savona	V0K 2J0	Travis Marr, Referrals Coordinator	travis@stkemlupsemc.ca					
Kamloops	Matt	Thompson	Tk'emlups Band	200-330 Chief Alex Thomas Way	Kamloops	V2H 1H1	Jessica Eustache, Referrals Officer	jessica.eustache@kib.ca					
Quesnel, Williams Lake	Matt	Central Interior	Tsilhqot'in National Government	253 Fourth Avenue North	Williams Lake	V2G 4T4	Crystal Verhaeghe, Executive Director	tng-director@tsilhqotin.ca					
Quesnel	Matt	Central Interior	Ulkatcho First Nation	PO Box 3436	Anahim Lake	V0L 1C0	Chief Zach Parker						Sent by Canada Post mail
Kelowna, Coldstream, Spallumcheen, Castlegar-Nelson, Trail, Celgar	Shelley	Nicola	Upper Nicola Indian Band	PO Box 3700, 2225 Village Road	Merritt	V1K 1B8	Lynne Jorgesen, Culture & Heritage Department	cultural.heritage@uppernicola.com	Bernadette Manuel	ch.projects@uppernicola.com			
Mackenzie	Matt	Northern	West Moberly First Nation	PO BOX 90	Moberly Lake	V0C 1X0	Chief Roland Willson						Sent by Canada Post mail
Kelowna	Shelley	South Interior	Westbank First Nation	301-515 Hwy 97 South	Westbank	V1Z 3J2	Nancy Bonneau, Archeology Supervisor/ Researcher	nbonneau@wfn.ca	Raf De Guevara	rdeguevara@wfn.ca	Stephanie Paul	spaul@wfn.ca	
Kamloops	Matt	Thompson	Whispering Pines/ Clinton Band	615 Whispering Pines Drive	Kamloops	V2B 8S4	Councillor Ed LeBourdais	ed.lebourdais@wpcib.com					Sent by Canada Post mail
Williams Lake	Matt	Central Interior	Williams Lake Indian Band	2672 Indian Drive	Williams Lake	V2G 5K9	Aaron Higginbottom, Natural Resource Manager						
Williams Lake	Matt	Central Interior	Xats'ull First Nation	3405 Mountain House Road	Williams Lake	V2G 5L5	Susan Aspinall, Referrals Coordinator	referrals@xatsull.com					

Appendix R-3

KTUNAXA NATION RESPONSE LETTER

KTUNAXA NATION

Ktunaxa Nation Council
7825 Mission Road
Cranbrook, BC V1C 7E5
tel: 250-489-2464
fax: 250-489-2438

visit us at:
www.ktunaxa.org

November 15, 2018

To: Blair Weston
Community and Aboriginal Relations Manager
Fortis BC

Re: FortisBC Inland Gas Upgrade Program

The proposed land and resource development activity falls within the territory of the Ktunaxa Nation in south-eastern British Columbia. Ktunaxa Nation has Aboriginal Rights, including Title that are protected under Section 35 of the Constitution Act, 1982 of Canada.

Further the Ktunaxa Nation filed a "Statement of Intent" to negotiate its outstanding Aboriginal Title and Treaty Rights in their traditional territory of December of 1993 and negotiations are ongoing.

The Ktunaxa Nation Council will seek to ensure that its rights and title are protected, including its stewardship responsibility and its right to benefit from economic activities and maintain access to the land to continue to exercise its Aboriginal rights. The Nation's stewardship responsibility for the land, which is bestowed upon it by the Creator, is also tied to its right to decide how the land can be used.

The Ktunaxa Nation Council is interested in engaging with FortisBC on several aspects of this project that relate to interests of the Ktunaxa Nation. At a high level those interests include understanding potential impacts to water, wildlife, aquatic species, vegetation, archaeology and other cultural values. The KNC would like to know more details regarding management planning for these values as the project moves forward.

The KNC would also like to express interest in increasing economic participation with respects to Fortis BCs' 'Inland Gas Project Upgrade'. The Ktunaxa Nation has spent rigorous amounts of time establishing both a political landscape, as well as an economy to strive towards self-sufficiency and self-sustainability. The Ktunaxa economy is rapidly growing, demonstrating capacity and competency, which allows our businesses and affiliated businesses to capitalize on opportunities arising in the territory.

The KNC acknowledges that Fortis BC has adopted 'Statement of Indigenous Principles', specifically in this instance '*FortisBC supports fair and equal access to employment and business opportunities within FortisBC companies for Indigenous Peoples'*. The Economic Sector would like to explore what opportunities may be available with the intent of increasing our participation, and fostering a relationship with FortisBC that allows for economic prosperity. By

enhancing our relationship the ability to encompass any and all opportunities around engagement, consultation, and increased economic participation will only strengthen allowing for an effective, efficient, forward thinking relationship.

In closing, the KNC would like to set up another meeting with FortisBC to discuss our interests and learn more details about the project as it moves forward. Please contact:

Michelle Dunn
Mdunn@ktunaxa.org
1-250-489-2464 ext.4308

Respectfully yours,

Kerri Garner
Ktunaxa Lands and Resources Sector
Ktunaxa Nation Council
Tel: (250) 489-2464
Email: kgarner@ktunaxa.org

Appendix R-4

FIRST NATIONS CORRESPONDENCE

From:	Thomson, Shelley
To:	"Eshknam CRMS Archaeology"
Cc:	Paul Mitchell-Banks
Subject:	RE: [External Email] - 1819-071 - Initial response - Small Projects - Fortis BC Inland Gas upgrade program to 29 natural gas lines in communities across BC.
Date:	Friday, July 6, 2018 12:04:00 PM

Good afternoon Paul,

Thank you for your response to our notification letter and I apologize for the delay in getting back to you.

I would be happy to keep you informed on the progress of the Inland Gas Upgrade Project and would be available to meet with you in person if you would like to discuss the natural gas lines within the traditional territory of the Nlaka'pamux Nation in more detail. Let me know if you'd like to set something up in the near future.

Alternatively, I can provide updates by email if you would prefer.

Have a great day!

Shelley
Community & Indigenous Relations Manager
Shuswap-Nicola-Okanagan-Similkameen

From: Eshknam CRMS Archaeology <eshknam.arch@gmail.com>
Sent: Tuesday, June 5, 2018 10:36 AM
To: Thomson, Shelley <Shelley.Thomson@fortisbc.com>
Cc: Paul Mitchell-Banks <paulmitchellbanks@gmail.com>
Subject: [External Email] - 1819-071 - Initial response - Small Projects - Fortis BC Inland Gas upgrade program to 29 natural gas lines in communities across BC.

**** THIS IS AN EXTERNAL EMAIL **** Use caution before opening links / attachments.

I am contacting you regarding a request for comments on an application from Fortis BC - Community & Aboriginal Relations for a upgrades to natural gas lines (KA1 LOP 168, KA1 LTL 168 and KE1 LOP 219 located in the Kamloops (Lateral and Loop) and Kelowna area(s).

Referral Response Team
Esh-kn-am Cultural Resources Management Services
#311-230th St., Coldwater IR 1
PO Box 2159
Merritt, BC V1K1B8
phone: (250) 315-0085
fax: (250) 315-0084
email: eshknam.arch@gmail.com

Esh-kn-am Cultural Resources Management Services

ECRMS File 1819-071

WITHOUT PREJUDICE

June 5, 2018

Shelley Thomson
Fortis BC - Community & Aboriginal Relations
1975 Springfield Road
Kelowna, BC
V1Y 7V7
Email: shelley.thomson@fortisbc.com

File Number: Inland Gas Upgrade Program

Dear Shelley,

I am contacting you regarding a request for comments on an application from Fortis BC - Community & Aboriginal Relations for a upgrades to natural gas lines (KA1 LOP 168, KA1 LTL 168 and KE1 LOP 219 located in the Kamloops (Lateral and Loop) and Kelowna area(s).

Recognizing the Rights and Title of the Bands this company works on behalf of, and realizing that the proposed work area is within the Nlaka'pamux Nation interest area, we have limited concerns within the area, as detailed in the referral letter, provided that the comments and concerns of the First Nations communities, and/or Tribal Council(s) that are nearest to the affected area(s) have been resolved to the satisfaction of those communities and/or Tribal Council(s).

We do ask, that should any previously unrecorded archaeological sites or heritage sites such as camps, human remains or lithics be encountered during the tenure and development of this project, the following measures should be undertaken:

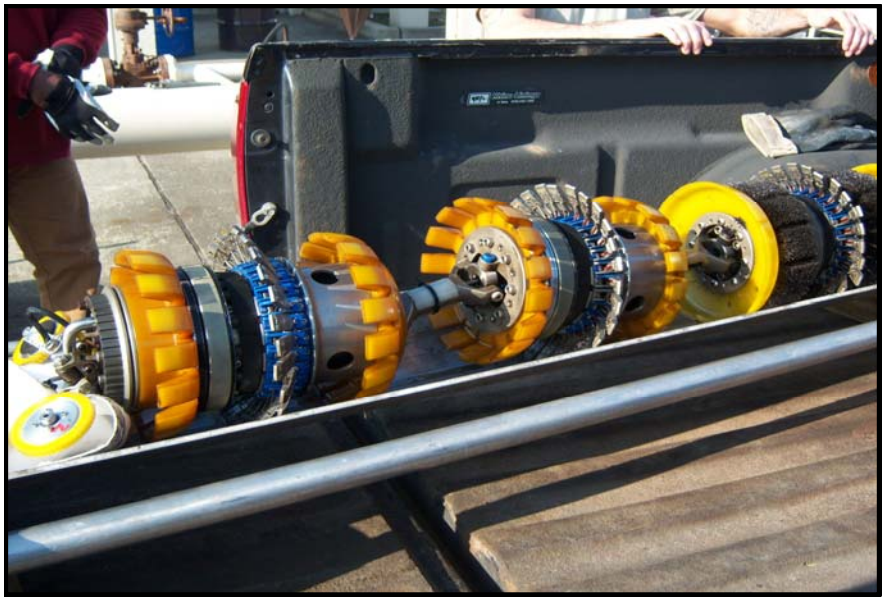
a) Modify or stop any land-altering activities in the immediate vicinity of the previously unidentified site so that it will not be adversely impacted; and
b) Promptly inform Esh-kn-am CRMS of the existence and location of the newly discovered site(s) so that an acceptable mitigation strategy or further archaeological investigation may be agreed upon.

These comments are submitted as a technical response on behalf of Coldwater, Cook's Ferry, and Siska Bands and in no way abrogates the Title and Rights of these Bands. This response is not considered consultation for the purpose of defining or limiting Aboriginal Title and Rights of any band. This response does not relinquish any part of the Bands' current or future claims to Aboriginal Title or Rights. If you have any questions regarding these comments, please contact myself at eshknam.arch@gmail.com or at 250-315-0085.

Thank you for your time,

Paul Mitchell-Banks, Ph.D., M.Sc. (Pl.), MBA, RPP, MCIP, EP.
Esh-kn-am Cultural Resources Management Services

❖ #311 – 230TH Street, Coldwater IR #1, ❖PO Box 2159, Merritt BC V1K 1B8 ❖
❖ Tele: 250-315-0085 ❖ Fax: 250-315-0084 ❖ e-mail: eshknam.arch@gmail.com ❖ Website: www.eshknam.ca ❖



FortisBC Inland Gas Upgrade Project

Overview

For the information of and use by
Neskonlith Indian Band, Skats'in Resources and Tmicw

Overview of Inland Gas Upgrade Project

As part of our Integrity Management Program, FortisBC is planning upgrades to 29 natural gas lines in communities across B.C. The majority of the work will enable us to inspect the inside of the gas lines using up-to-date in-line inspection equipment. This inspection method provides detailed information about the condition of each line and will allow us to better plan and manage maintenance work. Some of this work will require us to replace gas lines or fittings. In other cases, we will regulate the pressure in some sections of our system. The vast majority of this work will take place on existing right-of-ways.

The objective of this project is to…

- upgrade our gas lines, to use more up to date inspection methods without disrupting service to customers
- provide us with detailed information about the condition of each line
- allow us to better plan and manage maintenance work and detect issues before they become a problem

Why now?

Inspection tool technology has improved and tools that are compatible with the smaller diameter pipe size of our Interior system are now available.

Timeline*

Certificate of Public Convenience & Necessity (CPCN) Application Development	2017-2018
CPCN Application Submission to the BC Utilities Commission (BCUC)	September 2018
Application Review	September 2018-July 2019
Design & Engineering	August 2019-December 2020
BC Oil & Gas Commission (BCOGC) Permitting & Construction	2021-2025

**note: this timeline is currently an estimate and will be based on review and approval time period by the BCUC*

Recommended Alternatives: Project Descriptions

In-Line-Inspection (ILI)

- involves installing in-line inspection launching and receiving barrels at each end of the pipeline to allow ILI tools to be launched and received
- tools provide ability to analyze the lines for obstacles that could prevent successful tool runs including insufficient flow velocities, restrictive fittings and bends, small diameter pipelines, and numerous pipe or wall size changes

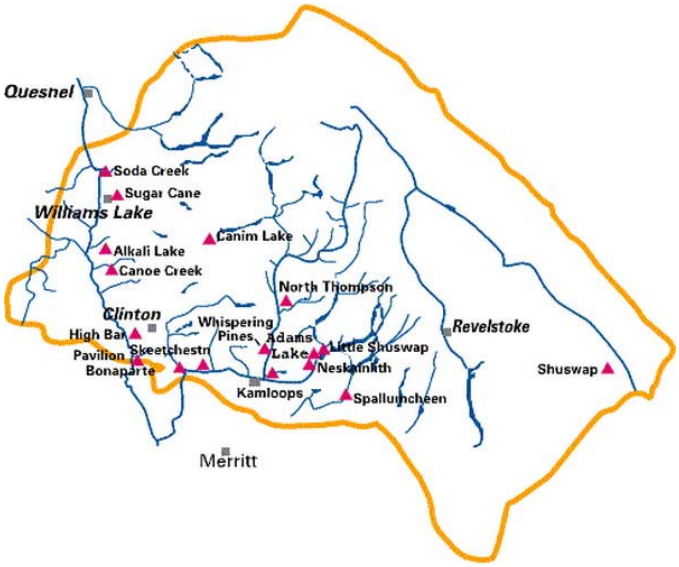
Pipeline Replacement (PLR)

- involves installing a new pipeline in parallel with the existing pipeline and abandoning in place the old line once the new line is operational

Pressure Regulating Station (PRS)

- involves installation of a pressure regulating station at the start of the pipeline and operating the line at less than 30% SMYS (Specified Minimum Yield Strength)
- accepted in the industry that operation below this level improves the longevity of the line without impacting service to customers

Laterals Identified within Secwepemc Traditional Territory



Williams Lake Loop 1 (WIL LP1)

- Lateral length: 3.4 kms
- Installed in 1993
- Pipe Diameter: 6”
- Proposed Upgrade option: pressure regulating

Williams Lake Loop 2 (WIL LP2)

- Lateral length: 2.8 kms
- Installed in 1998
- Pipe Diameter: 6”
- Proposed Upgrade option: pressure regulating

Kamloops Lateral (KA1 LTL)

- Lateral length: 3.6 kms
- Installed in 1965 (6”) & 1971 (8”)
- Pipe Diameter: this lateral includes a 6” section and an 500m section at the end that is 8”
- Valve assembly installed in 2009
- Valve station installed in 2012
- Proposed Upgrade option: pipeline replacement

Kamloops Loop (KA1 LOP)

- Loop length is 3.0 kms
- Runs parallel to Kamloops Lateral (above)
- Installed in 1979 (6”) & 2009 (8”)
- Pipe Diameter: this lateral includes a 6” section and an 500m section at the end that is 8”
- Valve assembly installed in 2009
- Proposed Upgrade option: pipeline replacement

Salmon Arm Loop (SAL LOP)

- Lateral length: 44.9 kms
- Installed in 1976-1993 (different sections at different times)
- Pipe Diameter: 6”
- Valve Stations installed in 2012 & 2013
- Proposed Upgrade option: in-line inspection

Salmon Arm 3 Lateral (SA3 LTL)

- Lateral length: 0.8 kms
- Installed in 1981
- Pipe Diameter: 6”
- Proposed Upgrade option: pipeline replacement

Celgar-Lateral (CEL LTL)

- Lateral length: 5.7 kms
- Installed in 1960
- Pipe Diameter: 6”
- Valve station installed in 2012
- Proposed Upgrade option: in-line inspection

Trail Lateral (TRA LTL)

- Lateral length: 4.2 kms
- Installed in 1957
- Water Crossing installed: 1992
- Pipe Diameter: 6”
- Proposed Upgrade option: in-line inspection

From:	Thomson, Shelley
To:	"Julie Richard"; Colleen Marchand
Cc:	Randy Marchand
Subject:	RE: [External Email] - RE: Project Notification: Inland Gas Upgrade Program
Date:	Thursday, May 24, 2018 11:12:00 AM

Good morning Julie,

My apologies for the delay in responding, I've been away of the office and am just catching up on emails.

I would be happy to come up to meet when it's convenient for you, Colleen & Randy. I hope the flooding situation in your community is starting to subside and that things will be back to normal soon.

My schedule is fairly open mid to late June so let me know if there is a date that works for all of you and we can get something scheduled. I will prepare maps of the project locations and the specific work that will be taking place in each area and will bring with me, but if there is anything else that would be helpful, let me know.

Thanks! Have a great day!

Shelley

Community & Aboriginal Relations Manager

Shuswap-Nicola-Okanagan-Similkameen

From: Julie Richard [mailto:julie.richard@okanagan.org]
Sent: Wednesday, May 9, 2018 10:36 AM
To: Thomson, Shelley <Shelley.Thomson@fortisbc.com>; Colleen Marchand <Colleen.Marchand@okanagan.org>
Cc: Randy Marchand <randy.marchand@okanagan.org>
Subject: [External Email] - RE: Project Notification: Inland Gas Upgrade Program

**** THIS IS AN EXTERNAL EMAIL **** Use caution before opening links / attachments.

Good Morning Shelley,

Colleen is currently occupied with Emergency Flooding. I am sure that once things have settled that we could have you come to our office for a review of the noted projects. I would hope that this can happen in a few week, provided the spring freshet cooperates.

Lim limpt/thank you

Julie Richard

Executive Assistant
Territorial Stewardship Division

Okanagan Indian Band
12420 Westside Road
Vernon BC, V1H 2A4

T: (250) 542-7132
C: (250) 309-5217
www.okib.org

From: Thomson, Shelley [mailto:Shelley.Thomson@fortisbc.com]
Sent: May-08-18 3:34 PM
To: Colleen Marchand <Colleen.Marchand@okanagan.org>
Cc: Randy Marchand <randy.marchand@okanagan.org>; Julie Richard <julie.richard@okanagan.org>
Subject: Project Notification: Inland Gas Upgrade Program

Good afternoon Colleen,

Attached please find a notification letter regarding a potential upgrade project FortisBC is planning. The document also contains maps of locations within your traditional territory where work is planned and I have attached kmz files for your reference.

We have hired Stantec Consulting and Hemerra Consulting to complete Archeological and Environmental assessments of these areas and they may be contacting you in the coming weeks.

I am working with James Pepper to schedule some time at an upcoming ONA Referrals Council meeting to review this project in more detail. In the meantime if you'd like to set up a separate meeting, I'd be happy to come see you. Should you have any questions, or if you'd like more information, feel free to give me a call.

Thanks!

Shelley Thomson
Community & Aboriginal Relations Manager
Shuswap-Nicola-Okanagan-Similkameen
Phone: 250.868.4525
Cell: 250.718.7041

FORTIS BC
Energy at work

From:	Thomson, Shelley
To:	"Amanda Anderson"
Cc:	Weston, Blair
Subject:	RE: [External Email] - IGU Project;
Date:	Friday, July 6, 2018 9:57:00 AM
Attachments:	CAS NEL 168.zip CAS NEL 168.kmz CEL LTL 168.zip CEL LTL 168.kmz TRA LTL 168.zip TRA LTL 168.kmz Letter - Notification Osoyoos.pdf

---

Good morning Amanda,

Happy Friday!

As a follow up to your conversation earlier this week with Blair, attached are the kmz and shape files for the proposed upgrades that are part of our Inland Gas Upgrade Project. I've also re-attached the original letter that was sent on May 8th for reference.

These are for the Celgar Lateral, Castlegar-Nelson Lateral and Trail Lateral. Just a note for your info that the bend locations identified in the attached files are only proposed at this time, and the final determination of the exact locations will be confirmed during detailed design. We will certainly keep you up to date as things progress.

Please let me know if you have any issues with the shape files or if there is anything missing. Also, let me know if you would like to set up a meeting to discuss in more detail or if you feel a presentation to OIB should be set up.

Feel free to give me a call if you have any questions or need more information. Have a great weekend!

Shelley
Community & Indigenous Relations Manager
Shuswap-Nicola-Okanagan-Similkameen

From: Amanda Anderson <aanderson@oib.ca>
Sent: Thursday, June 7, 2018 1:28 PM
To: Thomson, Shelley <Shelley.Thomson@fortisbc.com>
Subject: [External Email] - IGU Project;

**** THIS IS AN EXTERNAL EMAIL **** Use caution before opening links / attachments.

HI Shelley,

We have replied to Archaeological Permit application for the IGU Project; stating that we would like to participate in the PFR, discuss changing the repository location to NK MIP Desert and Heritage

Center and receive copies of the PFR reports.

I cannot seem to find the IGU referral we received; however if this is the Major project we were talking about earlier in the year OIB needs to be consulted for potential impacts to our Rights, Title and interests in that area.

Thank you,

Amanda Anderson
Referrals Officer

P: 250.498.3444 Ext. 3033
F: 250.498.6577
referrals@oib.ca
www.**oib**.ca/

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Thomson, Shelley

From: Mason, Matt
Sent: Friday, June 8, 2018 1:28 PM
To: 'Chelsea Enslow'
Subject: RE: [External Email] - RE: FortisBC Project Notification

Hi Chelsea,

Yes this is the only project at this point in time within territory.

Let me know if you have any other questions,

Kind regards,

Matt

-----Original Message-----
From: Chelsea Enslow <NaturalResources@bonaparteindianband.com>
Sent: Monday, June 4, 2018 2:55 PM
To: Mason, Matt <Matt.Mason@fortisbc.com>
Subject: RE: [External Email] - RE: FortisBC Project Notification

Hi Matt

I was just looking at the map you provided, and it appears to be in Kamloops. Is that the only pipeline you had registered as potentially within territory?

Thank you

Chelsea

-----Original Message-----
From: Mason, Matt [mailto:Matt.Mason@fortisbc.com]
Sent: May-08-18 1:37 PM
To: Chelsea Enslow <NaturalResources@bonaparteindianband.com>
Subject: Re: [External Email] - RE: FortisBC Project Notification

Great Chelsea!!!

Talk to you soon.

Matt

On May 8, 2018, at 1:35 PM, Chelsea Enslow
<NaturalResources@bonaparteindianband.com<mailto:NaturalResources@bonaparteindianband.com>> wrote:

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Hi Matt

I am Chelsea Enslow, and I took over for Kipp about a year ago. We will review what you provided and get in touch with you again in the near future.

Thank you

Chelsea Enslow, BSc. MNRM
Director of Natural Resources
Bonaparte Indian Band
T: 250-457-9624 Ext 278
Cell: 778-598-1138
E: naturalresources@bonaparteindianband.com<mailto:naturalresources@bonaparteindianband.com>

From: Mason, Matt [mailto:Matt.Mason@fortisbc.com]
Sent: May-08-18 12:17 PM
To: Chelsea Enslow <NaturalResources@bonaparteindianband.com<mailto:NaturalResources@bonaparteindianband.com>>; Bert William <Culturalheritage@bonaparteindianband.com<mailto:Culturalheritage@bonaparteindianband.com>>
Subject: FortisBC Project Notification

Hi Bert and Kip,

Please see the attached for a project construction is scheduled to be quite a few years out in the future.

If you would like to meet up to discuss please let me know.

Kind Regards,

Matt Mason
Community & Indigenous Relations Manager
Desk: 250-717-0815
Cell: 250-212-6428
matt.mason@fortisbc.com<mailto:matt.mason@fortisbc.com>
<image002.jpg>

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Thomson, Shelley

From: Land & Natural Resources Officer <landandresources@carrierchilcotin.org>
Sent: Tuesday, May 8, 2018 1:12 PM
To: Mason, Matt
Subject: [External Email] - RE: FortisBC Project Notification

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Good Day Matt,

You will need to consult directly with the First Nations regarding this project.

Thank you for the information.

Respectfully,
Karen Kubiski

Karen Kubiski, M.Sc., P.Ag., (Ecologist) Land & Resource Officer

| ***Southern Dakelh Nation Alliance***

A dynamic and growing Nation that demonstrates strong leadership in asserting inherent rights and title, supporting a vibrant economy, while sustaining a healthy natural environment.

Located at Carrier Chilcotin Tribal Council
| 59 First Avenue South | Williams Lake, BC V2G 1H4 | Work: (250)398-7033 ext: 211
| Fax: (250)398-6329 | landandResources@carrierchilcotin.org | www.carrierchilcotin.org

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From: Mason, Matt <Matt.Mason@fortisbc.com>
Sent: May 8, 2018 12:48 PM
To: Land & Natural Resources Officer <landandresources@carrierchilcotin.org>
Subject: FortisBC Project Notification

Good afternoon,

Please see the attached for a project construction is scheduled to be quite a few years out in the future.

If you would like to meet up to discuss please let me know.

Kind Regards,

Matt Mason
Community & Indigenous Relations Manager
Desk: 250-717-0815
Cell: 250-212-6428

Thomson, Shelley

From: Robyn Laubman <robyn.laubman@splatsindc.com>
Sent: Tuesday, July 17, 2018 3:39 PM
To: Thomson, Shelley
Cc: Ramsay McKee
Subject: [External Email] - RE: Project Notification: Inland Gas Upgrade Program

**** THIS IS AN EXTERNAL EMAIL **** Use caution before opening links / attachments.

Hi Shelley,

Hope your summer is going well so far. Would you please provide an update on these works to date and of any upcoming works when you get a chance? We have not heard from Hemmerra. I was also wondering if there was more information about the Salmon River work that we were notified of a few weeks ago?

Thanks,

Robyn Laubman, B.Sc., R.P.Bio.
Biologist
Yucwmenlúcwu (Caretakers of the Land)
Splatsin Development Corporation
5655 Hwy 97A Enderby, BC V0E 1V0
P: (250) 838-0775 Ext. 114 C: 250-307-1749

www.splatsindc.com

From: Thomson, Shelley [mailto:Shelley.Thomson@fortisbc.com]
Sent: Tuesday, May 8, 2018 3:55 PM
To: Ray Cormier (ray_cormier@splatsin.ca) <ray_cormier@splatsin.ca>; Adam Neil <adam.neil@splatsindc.com>
Subject: Project Notification: Inland Gas Upgrade Program

Good afternoon Ray,

Great to see you last week! Thanks again for taking the time to discuss the potential upgrade project we are considering. As discussed, attached is our notification letter including the maps of locations within your traditional territory where the work is planned along with kmz files for your reference.

We have hired Stantec Consulting and Hemerra Consulting to complete Archeological and Environmental assessments of these areas and they may be contacting you in the coming weeks.

If you would like to set up another meeting to discuss further, or if you would like to be kept up to date as our application progresses, let me know. Should you have any questions, feel free to give me a call.

Have a great day! Thanks!

Shelley Thomson
Community & Aboriginal Relations Manager

Thomson, Shelley

From: Mason, Matt
Sent: Wednesday, May 30, 2018 5:08 PM
To: 'Chus Sam'
Subject: RE: [External Email] - RE: Fortis BC Project Consultation
Attachments: NWP PG3 Overview.jpg; NWP PRS TWS.SHP; NWP PRS.SHP

Hi Chus,

Thanks for the call this afternoon.

The system consists of Northwood Pulp Lateral, Northwood Pulp Loop and Prince George 3 Lateral. I've attached a brief overview of the system to indicate which pipelines are which, and where the proposed station is.

The attached shape files are:

-NWP PRS: This is a high level proposed fenced area for our station, could change during detailed design but this is our current location
-NWP PRS TWS: This is the temporary workspace that will be affected by the proposed station location

Let me know if you need anything else.

Thanks,

Matt Mason
Community & Indigenous Relations Manager
Desk: 250-717-0815
Cell: 250-212-6428
matt.mason@fortisbc.com
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From: Chus Sam <csam@lheidli.ca>
Sent: Wednesday, May 9, 2018 2:00 PM
To: Mason, Matt <Matt.Mason@fortisbc.com>
Subject: [External Email] - RE: Fortis BC Project Consultation
Importance: High

**** THIS IS AN EXTERNAL EMAIL **** Use caution before opening links / attachments.

Hello Matt,

Please see attached Lheidli T'enneh response letter.

<<>>

Regards,

Chusnatlo Sam | Referrals Officer
Lheidli T'enneh | Natural Resources
Lheidli T'enneh

215 George Street | Prince George BC | V2L 1R1
Work: 250.562.0847 Ext. 201
Email: csam@lheidli.ca | Website: www.lheidli.ca

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From: Mason, Matt <Matt.Mason@fortisbc.com>
Sent: Tuesday, May 8, 2018 12:52 PM
To: Info <info@lheidli.ca>
Subject: FortisBC Project Notification

Good afternoon,

Please see the attached for a project construction is scheduled to be quite a few years out in the future.

If you would like to meet up to discuss please let me know.

Kind Regards,

Matt Mason
Community & Indigenous Relations Manager
Desk: 250-717-0815
Cell: 250-212-6428
matt.mason@fortisbc.com

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LHEIDLI T'ENNEH - MAIN BAND OFFICE
1041 Whenun Road | Prince George, BC V2K 5X8 | p: (250) 963-8451 or 1-877-963-8451 | f: (250) 963-6954
www.lheidli.ca

Lheidli T'enneh
Wheni Lheidli T'enneh ts'inli

May 9, 2018

Fortis BC Inc
1975 Springfield Road
Kelowna BC, V1Y 7V7
Via email: matt.mason@fortisbc.com

Re: Fortis BC Inland Gas Upgrade Program

Dear Matt Mason,

Lheidli T'enneh has received the Fortis BC Inland Gas Upgrade Program Letter on May 7, 2018.

Lheidli T'enneh possesses Aboriginal Rights within our Territory as framed within Section 35 of the Constitution Act (1982). These "recognized" rights include, but are understood not to be limited to:

1. The harvest of wildlife, including fish, and the harvest of plants, including fruits and other plant components, for food, social and ceremonial purposes
2. The use and/or harvest of timber to meet personal needs
3. The use and occupation of lands related to the exercise of rights
4. The management of Territorial lands related to the exercise of rights (burning, transfer of fish from waterbody to waterbody, etc.)
5. The use of other components of the landscape (water, rock, etc.) related to the exercise of rights, and the use and occupation of lands related to the exercise of rights

Consideration of these constitutionally recognized Aboriginal rights extends to Aboriginal interests that include any matter which may alter our ability to meaningfully exercise our rights within our Traditional Territory (i.e. matters that are subject to Consultation), including (but not limited to):

1. The permanent or temporary alienation of lands;
2. Alteration of lands and waterways;
3. Land/water uses and activities that impart impacts on the productive capacity of ecosystems that may affect their ability generate flora and fauna; and
4. Factors that impart increased competition for resources including exploitation management, and access management.

Deep and meaningful consultation is required for the following reasons:

1. Lheidli T'enneh has a very strong and uncontested *prima facie* Aboriginal rights, including title, claim to the Land (*Haida v. The Province of British Columbia*);

2. Thus, this scenario is situated on the very high end of the spectrum of consultation (*Haida v. The Province of British Columbia*) and attracts a very high level of ongoing consultation and accommodation.

Please accept our preliminary concerns/comments:

- No consultation with Lheidli T'enneh when the project was first built, therefore was no initial consultation, mitigation, or accommodation aspects for the impacts
- We expect this referral to be placed into deep consultation level, not a notification
- We require a detailed project schedule and to include site maps at 1:20,000 scale for each location in addition to an overview map 1:100,000. Also include all road access and laydown areas
- Please provide shp. file mapping data for all proposed activities
- Preliminary data review indicates direct impact from the current pipeline and associated O&M activities to our continued traditional use aspects that we documented in the Lheidli T'enneh 1999 TUS study funded by Ministry of Forests
- Any further activity on this pipeline will require mitigation and accommodation aspects

Please contact the below to further discuss the Spectra's obligation to Lheidli T'enneh to meaningfully consult and provide accommodation.

We look forward to hearing from you at your earliest convenience on this very important matter.

Snachailyah,

Chusnatlo Sam
Natural Resources Referrals Officer
Lheidli T'enneh First Nation
Phone: 250.562-0847 | Email: csam@lheidli.ca

Appendix S

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Acronym or Term	Definition
29 Transmission Laterals	The 29 transmission pressure laterals that are NPS 6 and greater, without in-line inspection capability and that are operating above 30% SMYS. These are the laterals in the scope of the Inland Gas Upgrades project.
AACE	AACE International, Inc. AACE previously referred to the Association for the Advancement of Cost Engineering International. The legal corporate name is AACE International, Inc. The Association was chartered in 1956 as the American Association of Cost Engineers.
AFUDC	Allowance for Funds Used During Construction, which allows for the cost of borrowing funds until a project is placed into service to be included in rates; the requirement for AFUDC forms a separate line item of the overall project cost.
AIA	Archaeological Impact Assessment
ALR	Agricultural Land Reserve
Anode	In corrosion protection, a formed metal - usually zinc, aluminum, or magnesium - buried near and connected to a structure of lesser galvanic potential such that the metal corrodes in favor of the structure.
AOA	Archaeological Overview Assessment
Barrels	The barrels are the assemblies at the start and end of the pipeline segment being inspected. These assemblies are where the in-line inspection tool is loaded into the pipeline and also retrieved from the pipeline.
Bcf	Billion cubic feet
BCUC	British Columbia Utilities Commission, or Commission - The BCUC is the provincial body regulating utilities in British Columbia.
Block Valve	Main line valve designed to close in or shut down gas flow.
BOE	Basis of Estimate
BR	Bend Replacement
Burner Tip	A generic term that refers to the ultimate point of consumption for natural gas.
Butt Weld	The joining of two pieces of pipe or other material by full penetration welds.
Bypass	An auxiliary piping arrangement, generally to carry gas around specific equipment or an integral section of a piping system. A by-pass is usually installed to permit passage through the line while adjustments or repairs are made on the section which is by-passed.

Acronym or Term	Definition
CAPEX	Capital Expenditure
Capital Cost	Expenditures to acquire or improve assets with a service life of greater than one year.
Cathode	Negative electrode in an electrolytic system. See Anode
Cathodic Protection	A technique to prevent the corrosion of a metal surface by making that surface the cathode of an electrochemical cell. Generally considered a secondary defense (or corrosion management strategy) that relies on the existence of an external pipe coating as the primary defense.
CNG	Compressed Natural Gas
Commission	see British Columbia Utilities Commission, BCUC
Compression, Compressor Station	The application of increased pressure a natural gas pipe system to create gas flow. Higher levels of compression can be applied to increase the carrying and storage capacity of the pipe. Increased pressure is applied through a compressor station constructed along the pipeline.
Confidence Level	The probability: 1) That results will be equal to or more favorable than the amount estimated or quoted; or 2) That the decision made will achieve the desired results; or 3) That the stated conclusion is true.
Control Valve	A control valve is a device typically used to manipulate the pressure or flow conditions in a system.
COP	Certified Operating Pressure.
Core, core customers, Core market	Residential, commercial and small industrial customers that have gas delivered to their home or business (bundle sales). FortisBC purchases natural gas and delivers it to the customer in a bundled sales rate. Core Market customer typically use a significant portion of their gas requirements for heating applications, resulting in weather sensitive demand.
Corrosion	Destruction of a metal by chemical or electrochemical reaction with its environment.
CP	Cathodic protection
CP Shielding	Shielding occurs when the cathodic protection (CP) current is prevented from reaching the pipeline.
CPCN	Certificate of Public Convenience and Necessity – A certificate obtained from the British Columbia Utilities Commission under Section 45 of the Utilities Commission Act for the construction and/or operation of a public utility plant or system, or an extension of either, that is required, or will be required, for public convenience and necessity.
CPI	Acronym for Consumer Price Index

Acronym or Term	Definition
CSA	Canadian Standards Association
CVA	Control Valve Assembly. An assembly of piping and valves for the purpose of controlling operating pressure on the pipeline.
Deferred Cost	Cost that incurred but that will be expensed in the future.
DP	Distribution pressure (70 – 700 kPag)
ECDA	External Corrosion Direct Assessment. A method of evaluating pipeline condition that relies on information collected from above-ground surveys (indirect inspection) and investigative digs (direct evaluation).
EMAT	Electro-Magnetic Acoustic Transducers
EOA	Environmental Overview Assessment
Fabrication	The assembly of pipes, fittings, and valves typically in a controlled indoor environment.
FEED	Front End Engineering Design
FEI	FortisBC Energy Inc.
FID	Facility Identification Number – a number assigned by FEI, used in various company systems as a unique asset identifier.
Girth Weld	A circumferential weld at a joint connecting two pipes.
GIS	Geographical Information System
GJ – Gigajoule	A measure of energy of natural gas – one billion joules. One joule of energy is equivalent to the heat needed to raise the temperature of one gram (g) of water by one degree Celsius (°C) at a standard pressure (101.325 kPa) and standard temperature (15°C).
HCA	Heritage Conservation Act
HDD	Horizontal directional drilling – a trenchless construction method for the installation of underground piping.
Hoop Stress	The force per unit area exerted in the circumferential direction of the pipe wall due to the internal pressure of the fluid in the piping.
HSTP	Hydrostatic Testing Program Alternative
IGU	Inland Gas Upgrades
ILI	In-line inspection – A widely accepted industry practice to monitor pipeline condition.

Acronym or Term	Definition
ILI Tool	A data collection device ,commonly referred to as a smart tool or pig, that is inserted inside an operating pipeline to obtain indirect measurement and locations of imperfections such as metal loss, dents, and mechanical damage that may adversely affect the pipeline.
IMP	Integrity Management Program
Induction Bend	A method of bending pipes using local heat and high frequency induced electrical power used to achieve a large radius of curvature.
Integrity Dig	Exposing a section of pipeline via excavation for a detailed assessment of the pipe condition.
IP	Intermediate pressure (701 – 2,069 kPag)
ITS	Interior Transmission System
KP	Kilometer Post
kPa	Kilopascal - a metric measurement unit of pressure. Gauge pressure is often given in units with a 'g' appended, e.g. 'kPag'.
LA, RA	Launcher Assembly, Receiver Assembly. See Barrels
Leak	A limited loss of natural gas containment that does not represent a significant safety hazard.
LNG	Liquefied Natural Gas - Natural gas stored under high pressure, which turns to liquid form. Approximately 600 times as much natural gas can be stored in its liquid state than in its typical gaseous state; however, specialized storage facilities must be constructed.
Looping	The twinning of sections of gas transmission pipeline to improve flow characteristics within the service area.
LTGRP	Long Term Gas Resource Plan – A plan that identifies resource requirement and acquisition strategies to meet expected natural gas demand and reliability requirements at the lowest reasonable cost to customers over a 20 year planning horizon.
MLVA	Main Line Valve Assembly. Valves that are installed intermittently onto a long pipeline that can be used to isolate sections of the pipeline.
mm	Millimeter
MMscfd	one million standard cubic feet per day
MOP	Maximum operating pressure.
MOTI	B.C. Ministry of Transportation and Infrastructure
NACE	National Association of Corrosion Engineers

Acronym or Term	Definition
NDE	Non Destructive Evaluation
NPS	Nominal pipe size
NPV	Net Present Value
OD	Outside diameter
OGAA	Oil and Gas Commission Activities Act
OGC	British Columbia Oil and Gas Commission
OPEX	Operating Expenditure
P10, P50, P90	The P values refer to a confidence level regarding the probability of the cost not being exceeded. The P90, P50 and P10 represent 90%, 50%, and 10% probability of cost not being exceeded respectively.
Peak day, peak demand, peak day demand	The maximum expected amount of gas in any one day or hour required by customers on the FEI system. Core customers' demand is primarily weather dependent. For large transportation customers, the peak demand is equivalent to the firm contract demand.
PFR	Preliminary Field Reconnaissance
PLE	Pipeline Exposure and Re-coat Alternative
PLR	Pipeline Replacement Alternative
Portfolio	An Array of assets-projects, programs, or other valuable and often revenue-producing items-that are grouped for management convenience or strategic purpose.
PRS	Pressure Regulating Station Alternative
Psig	Pounds per square inch gauge - A measurement of pressure
Purging	The act of replacing the atmosphere within a container by an inert substance in such a manner as to prevent the formation of explosive mixtures.
Re Light	The act of restarting gas service to a customer after a shut in
ROW	Right-of-way.
RTU	Remote terminal unit

Acronym or Term	Definition
Rupture	Instantaneous release of natural gas that impacts the operation of a pipeline segment such that the pressure of the segment cannot be maintained.
SCADA	System Control and Data Acquisition – The SCADA system provides centralized control of selected remote equipment, while also typically gathering and recording data attributes such as operating pressure and temperature for the purposes of system monitoring and analysis.
Shut in / Shut down	The act of shutting off gas supply to a gas pipeline or customer service line such that there is no gas flow into the line. Shut in /Shut down ensures the gas supply system will be positively isolated from customer service lines when it is re-pressurized. This is a public safety measure to prevent re-pressurization of private systems whose condition will not have been verified until assessed by a qualified person during a relight campaign.
SMYS	Specified Minimum Yield Strength
SRW	Statutory Right of Way
Station	A specific location at which there is an assembly of piping including some of, but not limited to, valves, fittings, flanges, regulators, measuring devices, etc., for the purpose of controlling the gas flow in some manner (e.g., pressure control, flow control, isolation)
Stopple Fitting	A fitting that is welded onto an in service pipeline to enable isolation of a segment of the pipeline.
Telemetry	An automated communications process where measurements and other data can be collected from remote points which are then transmitted to receiving equipment for monitoring.
TP	Transmission pressure (2,070 – 9,930 kPag)
TWS	Temporary Work Space
UCA or Act	Utilities Commission Act
UWR	Ungulate Winter Range
Verification Run	An in-line inspection run with a tool capable of navigating most restrictions to verify that all obstructions have been removed from the pipeline for ILI smart tool capability.
WHA	Wildlife Habitat Area

Appendix T

DRAFT ORDERS AND CONFIDENTIALITY DECLARATION AND UNDERTAKING FORM

Appendix T-1

DRAFT PROCEDURAL ORDER

bcuc
British Columbia
Utilities Commission

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
bcuc.com

P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

ORDER NUMBER
G-xx-xx

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

Application by FortisBC Energy Inc.
For a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On December 17 2018, FortisBC Energy Inc. (FEI) submitted an Application for a Certificate of Public Convenience and Necessity (CPCN) to the British Columbia Utilities Commission (BCUC) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Inland Gas Upgrade (IGU) Project.

B. FEI states that the IGU Project is necessary to implement the most cost-effective integrity management solutions to mitigate the potential for rupture failure due to corrosion on 29 laterals in the interior of BC constructed between 1957 and 1998 (the 29 Transmission Laterals);

C. As part of the IGU Project, FEI will:

- Retrofit 11 transmission laterals to provide ILI capability;
- Construct pressure regulating stations on 14 transmission laterals to reduce the maximum operating pressure and resulting operating stress to below 30 percent of the specified minimum yield strength (SMYS) of the pipe; and
- Replace 4 transmission laterals with new pipe designed to operate at a stress below 30 percent of the SMYS of the pipe;

D. FEI also seeks BCUC approval under sections 59-61 of the Act for a deferral account to capture the costs of preparing the Application and of the preliminary stage development of the IGU Project, including costs of assessing the feasibility of the Project, developing and evaluating preliminary design and alternatives;

E. FEI estimates the total cost of the IGU Project to be approximately $363.895 million in as-spent dollars, including Allowance for Funds Used During Construction (AFUDC), cost of removal, and Project deferrals;

F. FEI proposes construction to begin in early Q2 2020, and expects to have work on all of the 29 Transmission Laterals completed by Q3 2024 with contractor demobilization and restoration to occur in late 2024;

G. FEI request that certain Appendices be treated as confidential due to commercial sensitivity and to maintain public safety;

H. The BCUC has determined that a public hearing is appropriate to review the Application.

NOW THEREFORE the BCUC orders as follows:

1. A written hearing is established for the review of the Application in accordance with the Regulatory Timetable as set out in Appendix A to this order.

2. FEI is to publish the Public Notice by January 25, attached as Appendix B to this Order, in such local and community newspapers as to provide adequate notice to those parties who may have an interest in or be affected by the Application.

3. The Application, together with any supporting materials, will be available for inspection at the FEI Office, 16705 Fraser Highway, Surrey, BC, V4N 0E8. The Application and supporting materials will also be available on the FortisBC website at www.fortisbc.com and on the BCUC website at www.bcuc.com.

4. Interveners who wish to participate in the regulatory proceeding are to register with the BCUC by completing a Request to Intervene Form, available on the BCUC's website at http://www.bcuc.com/Registration-Intervener-1.aspx by the date established in the Regulatory Timetable attached as Appendix A to this order and in accordance with the BCUC's Rules of Practice and Procedure attached to Order G-1-16.

5. Participants intending to apply for Participant Assistance/Cost Award (PACA) exceeding $10,000 must file a completed PACA Budget Estimate form by [DATE]. PACA applications should be consistent with the BCUC's PACA Guidelines and Order G-97-17. Copies of the PACA Guidelines are available upon request or can be downloaded from the BCUC's website at http://www.bcuc.com.

DATED at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)
Commissioner

Attachment

FortisBC Energy Inc.
Application for Certificate of Public Convenience and Necessity for the Inland Gas Upgrade Project

REGULATORY TIMETABLE

Action	Date (2019)
BCUC Issues Procedural Notice	Week of January 7
FEI Publishes Notice by Week of	Week of January 21
BCUC Information Request (IR) No. 1	Thursday, February 7
Intervener and Interested Party Registration	Tuesday, February 12
Intervener IR No. 1	Tuesday, February 19
FEI Response to IR No. 1	Thursday, March 14
BCUC and Intervener IR No. 2	Tuesday, April 9
FEI Responses to IR No. 2	Tuesday, May 7
FEI Written Final Submission	Wednesday, May 22
Intervener Written Final Submission	Thursday, June 6
FEI Written Reply Submission	Thursday, June 20

bcuc
British Columbia
Utilities Commission

APPENDIX B
to Order G-xx-xx

PUBLIC NOTICE

FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project

On December 17 2018, FortisBC Energy Inc. (FEI) filed an Application for a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project. FEI is requesting approval to implement integrity management upgrades and retrofits on 29 existing transmission pressure natural gas lines in the interior of BC. FEI identified this Project as part of its ongoing system integrity program and states it is needed to ensure continued safe and reliable service to its interior customers. The estimated total cost of the Project is $363.895 million.

HOW TO PARTICIPATE

There are a number of ways to participate in a matter before the BCUC:

- **Submit a letter of comment**
- **Register as an interested party**
- **Request intervener status**

For more information, or to find the forms for any of the options above, please visit our website or contact us at the information below.

http://www.bcuc.com/forms/request-to-intervene.aspx

All submissions received, including letters of comment, are placed on the public record, posted on the BCUC's website and provided to the Panel and all participants in the proceeding.

NEXT STEPS [If necessary]

1. **[Intervener registration** Persons who are directly or sufficiently affected by the BCUC's decision or have relevant information or expertise and that wish to actively participate in the proceeding can request intervener status by submitting a completed Request to Intervene Form by [date].]

2. **[Procedural conference** A procedural conference is scheduled to take place on [date], commencing at [time] in the Commission Hearing Room, Twelfth Floor, 1125 Howe Street, Vancouver, BC. At the procedural conference, the BCUC will hear from the applicant and registered interveners on [the appropriate regulatory process]. Members of the public are welcome to attend.]

GET MORE INFORMATION

All documents filed on the public record are available on the "Current Proceedings" page of the BCUC's website at *www.bcuc.com*.

If you would like to review the material in hard copy, or if you have any other inquiries, please contact Patrick Wruck, Commission Secretary, at the following contact information.

Appendix T-2

DRAFT ORDER

bcuc
British Columbia
Utilities Commission

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
bcuc.com

P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

ORDER NUMBER
C-xx-xx

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and
Application by FortisBC Energy Inc.
For the Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On December 17 2018, FortisBC Energy Inc. (FEI) submitted an Application for a Certificate of Public Convenience and Necessity (CPCN) to the British Columbia Utilities Commission (BCUC) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Inland Gas Upgrade (IGU) Project.

B. FEI states that the IGU Project is necessary to implement the most cost-effective integrity management solutions to mitigate the potential for rupture failure due to corrosion on 29 laterals in the interior of BC constructed between 1957 and 1998 (the 29 Transmission Laterals);

C. As part of the IGU Project, FEI will:

- Retrofit 11 transmission laterals to provide ILI capability;
- Construct pressure regulating stations on 14 transmission laterals to reduce the maximum operating pressure and resulting operating stress to below 30 percent of the specified minimum yield strength (SMYS) of the pipe; and
- Replace 4 transmission laterals with new pipe designed to operate at a stress below 30 percent of the SMYS of the pipe;

D. FEI also seeks BCUC approval under sections 59-61 of the Act for a deferral account to capture the costs of preparing the Application and of the preliminary stage development of the IGU Project, including costs of assessing the feasibility of the Project, developing and evaluating preliminary design and alternatives;

E. FEI estimates the total cost of the IGU Project to be approximately $363.895 million in as-spent dollars, including Allowance for Funds Used During Construction (AFUDC), cost of removal, and Project deferrals;

F. FEI proposes construction to begin in early Q2 2020, and expects to have work on all of the 29 Transmission Laterals completed by Q3 2024 with contractor demobilization and restoration to occur in late 2024;

G. A written public hearing process was conducted including two rounds of information requests; and

H. The BCUC Panel has reviewed and considered the Application and concludes that the Project is in the public interest and that a CPCN should be granted.

NOW THEREFORE the Commission orders as follows:

1. Pursuant to Sections 45 and 46 of the *Utilities Commission Act*, a Certificate of Public Convenience and Necessity is granted to FEI for the IGU Project, as applied for in the Application.

2. Pursuant to Section 59 to 61, recording the costs of preparing the Application and the costs of evaluating the feasibility of and preliminary stage development of the IGU Project in a deferral account is approved. FEI shall establish the IGU Application and Preliminary Stage Development Cost deferral account. This account will attract the weighted average after tax cost of capital return until December 31, 2019 and will be transferred to Rate Base on January 1, 2020 with a three-year amortization period.

3. FEI shall file with the BCUC within 30 days of the end of each reporting period Quarterly Progress Reports on the Project. The Quarterly Progress Reports will describe in some detail the risks that the project is experiencing, the options to address the risks, the actions FEI is taking to deal with the risks and the likely impact on the Projects' schedule and costs.

4. FEI shall file with the BCUC a Final Report, within six months of the end or substantial complete of the Project, that provides a breakdown of the final costs of the Project, compares these costs to the cost estimates and provides an explanation and justification of material cost variances.

DATED at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)
Commissioner

Attachment (Yes? No?)

Appendix T-3

CONFIDENTIALITY DECLARATION AND UNDERTAKING FORM

Confidentiality Declaration and Undertaking Form

In accordance with the British Columbia Utilities Commission' (BCUC) Rules of Practice and Procedure, please provide a completed form to the party who filed the confidential document and copy Commission Secretary at commission.secretary@bcuc.com. If email is unavailable, please mail the form to the address above.

Undertaking

I, __[name]___, am representing the party _____ in the matter of

__FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project ~ Project No. [xx]._____

In this capacity, I request access to the confidential information in the record of this proceeding. I understand that the execution of this undertaking is a condition of an Order of the Commission, and the Commission may enforce this Undertaking pursuant to the provisions of the *Administrative Tribunal Act*.

Description of document:	Confidential materials filed in the proceeding, in unredacted form.

I hereby undertake:

(a) to use the information disclosed under the conditions of the Undertaking exclusively for duties performed in respect of this proceeding;

(b) not to divulge information disclosed under the conditions of this Undertaking except to a person granted access to such information or to staff of the Commission;

(c) not to reproduce, in any manner, information disclosed under the conditions of this Undertaking except for purposes of the proceeding;

(d) to keep confidential and to protect the information disclosed under the conditions of this Undertaking;

(e) to return to the applicant, _FortisBC Energy Inc._, all documents and materials containing information disclosed under the conditions of this Undertaking, including notes and memoranda based on such information, or to destroy such documents and materials within fourteen (14) days of the Commission's final decision in the proceeding; and

(f) to report promptly to the BCUC any violation of this Undertaking.

Signed at __[place]___ this _[day] day of [month] 2019__.

Signature: _____

Name (please print): ___[Name]_____

Representing (if applicable): _____