Diane Roy
Vice President, Regulatory Affairs

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

Electric Regulatory Affairs Correspondence
Email: electricity.regulatory.affairs@fortisbc.com

FortisBC
16705 Fraser Highway
Surrey, B.C. V4N 0E8
Tel: (604) 576-7349
Cell: (604) 908-2790
Fax: (604) 576-7074
www.fortisbc.com

February 11, 2021

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

Attention: Ms. Marija Tresoglavic, Acting Commission Secretary

Dear Ms. Tresoglavic:

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

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Coastal Transmission System Transmission Integrity Management Capabilities Project (CTS TIMC Project or the Project)

Pursuant to sections 45 and 46 of the Utilities Commission Act (UCA), FEI applies to the British Columbia Utilities Commission (BCUC) for a CPCN for the CTS TIMC Project as described in the attached Application. In this Application, FEI is also requesting approval, pursuant to sections 59-61 of the UCA, to recover the balance of costs in the TIMC Development Cost deferral account associated with the development of the Application, estimated at $13.2 million, by amortizing the December 31, 2021 actual balance of these costs over 3 years commencing in 2022.

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, as set out in Order G-15-19.

- Appendix B – JANA's (Quantitative Risk Assessment expert) Reports
- Appendix D – Stantec FEED Report Documents
- Appendix E – Risk Analysis
- Appendix G – 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.

Appendix B

Appendix B consists of reports to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a quantitative risk assessment (QRA) of the safety risks to FEI's transmission systems. These QRA expert reports identify vulnerable points on the Company's gas transmission system and areas of risk to FEI's assets 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.

Appendices D and E

Appendices D and E are engineering and risk analysis documents and should be kept confidential on the basis that they contain operationally sensitive information pertaining to the Company's assets, which 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 areas of risk to 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.

Appendix G

Appendix G 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 L-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 the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Registered Parties in the FEI Annual Review for 2020 and 2021 Delivery Rates
Residential Consumer Intervener Group (via its agent Midgard Consulting Incorporated)

FortisBC Energy Inc.

Application for Approval of a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project

February 11, 2021

Table of Contents

List of Appendices

Index of Tables and Figures

1. APPLICATION

1.1 *INTRODUCTION*

FortisBC Energy Inc. (FEI or the Company) applies to the British Columbia Utilities Commission (BCUC), pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA), for a Certificate of Public Convenience and Necessity (CPCN) for the Coastal Transmission System (CTS) Transmission Integrity Management Capabilities (TIMC) Project (referred to as the CTS TIMC Project or the Project) as described in this application (Application). FEI is also requesting approval, pursuant to sections 59-61 of the UCA, to recover the balance of costs in the TIMC Development Cost deferral account associated with the development of the CTS TIMC Application estimated at $13.2 million by amortizing the December 31, 2021 actual balance of these costs over 3 years commencing in 2022.

The CTS TIMC Project is a pipeline integrity project that is required for FEI to continue to operate 11 of its CTS pipelines safely. FEI has determined that these 11 CTS pipelines are susceptible to cracking threats that can lead to failure by rupture. Further, a quantitative risk assessment (QRA) shows that the risk posed by these cracking threats is the highest contributor to safety risk on the CTS. The only technically and financially feasible alternative to mitigate these cracking threats is to adopt electro-magnetic acoustic transducer (EMAT) in-line inspection (ILI) tools. EMAT ILI tools are increasingly becoming the standard industry practice for mitigating cracking threats on pipelines of this size. Given FEI's obligations to ensure safe and reliable operation of its assets, FEI must keep pace with evolving industry practice and regulatory expectations for managing the safety risk posed by cracking threats. The potential consequences of not doing so are significant and unacceptable to FEI.

The Project, which is confined to existing rights of way and facilities, consists of the alterations to six CTS pipelines with replacement of 13 heavy wall segments and alterations to 13 facilities that are necessary to ready the 11 CTS pipelines for EMAT ILI. The Project will also install a pressure regulating station (PRS) on a single segment of one of the pipelines where EMAT ILI is not possible. The estimated total cost of the Project in as-spent dollars is $137.8 million, which includes an Allowance for Funds Used During Construction (AFUDC).

While FEI has determined that its Vancouver Island Transmission System (VITS) has low susceptibility to cracking threats, nine of FEI's Interior Transmission System (ITS) pipelines are considered susceptible to cracking. As a result, FEI is the process of developing an ITS TIMC Project to address the risk to the ITS posed by cracking. The results of the QRA, which concluded the CTS posed the highest safety risk at the system level, support FEI's decision to prioritize work on the CTS with this Application.

FEI submits that the information provided in this Application, which meets the requirements of the BCUC's CPCN Guidelines[1], demonstrates that the Project is in the public interest.

[1] Appendix A to Order G-20-15.

FEI requests that the Project be approved as set out in the Application. A draft Procedural Order and draft Final Order are included in Appendices L-1 and L-2, respectively.

1.2 SUMMARY OF APPROVALS SOUGHT

FEI is seeking the necessary approvals to implement the Project as proposed and ensure the appropriate financial treatment of costs for regulatory purposes. The approvals are summarized below. The specific form of approvals sought is set out in the draft order in Appendix L-2.

1.2.1 Certificate of Public Convenience and Necessity

Pursuant to sections 45 and 46 of the UCA, FEI requests that the BCUC grant a CPCN for the CTS TIMC Project as described in the Application. The Project will encompass the components of the Project as summarized below and described in detail in Section 5 of the Application:

1. Alterations to six CTS pipelines, consisting of the replacement of 13 heavy wall segments within existing rights of way, to enable the EMAT ILI tools to travel within their optimal velocity range, at the locations shown in the Figure 1-1 below.
2. Alterations to 13 CTS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure, flow and backflow regulating capability, as needed to run the EMAT ILI tools, in the locations shown in Figure 1-2 below.

Figure 1-1: Project Overview Map Showing Pipeline Alteration Locations

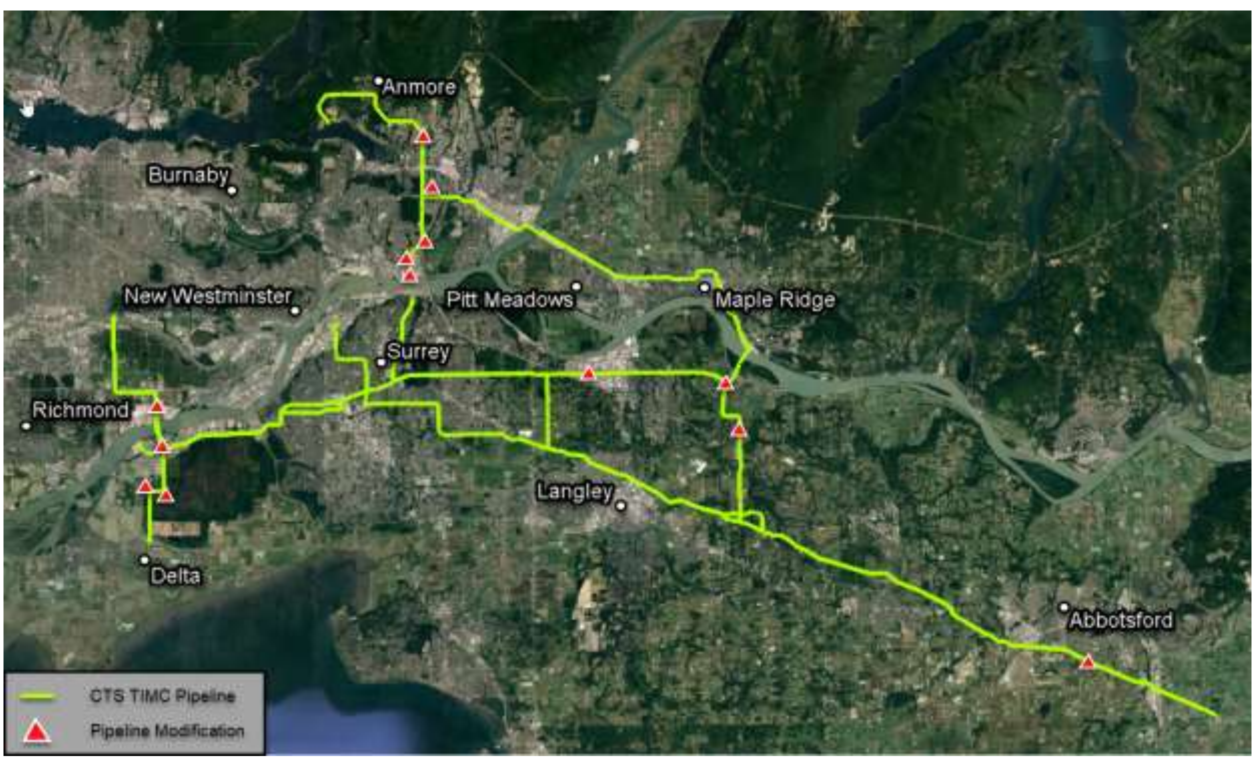
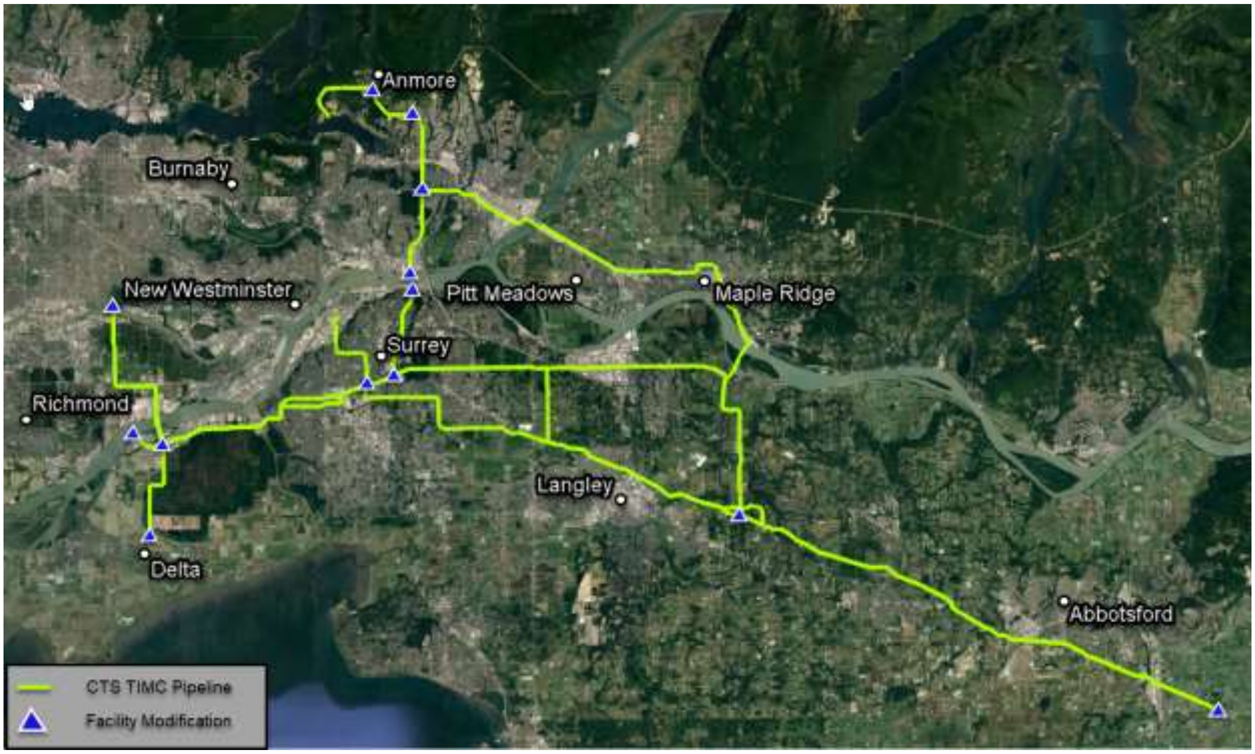


Figure 1-2: Project Overview Map Showing Facilities Alteration Locations



1.2.2 Disposition of Balance in TIMC Development Cost Deferral Account

In Order G-237-18, the BCUC approved the creation of the TIMC Development Cost deferral account, attracting a WACC return, with disposition to be proposed in a future application. As explained in Section 5.3.2, costs charged to the TIMC deferral account include:

- Preliminary Stage Development Costs, which consist of the development of a QRA, records and data refinement, and EMAT ILI Pilot project costs;
- The Pre-Construction Development Costs, which include the costs related to front-end engineering and design, CPCN development costs including environmental assessments, Indigenous engagement, and stakeholder consultation; and
- Application Costs, which include CPCN proceeding costs, which were estimated based on a written process with two rounds of Information Requests and one workshop.

FEI is seeking approval pursuant to sections 59 to 61 of the UCA to recover the portion of the balance in the deferral account related to the CTS TIMC Project by amortizing the December 31, 2021 deferral account balance related to the Project over 3 years commencing in 2022. FEI will continue to incur costs related to the ITS TIMC Project and record, and track them separately, in the deferral account and FEI will request recovery of those costs as part of the ITS TIMC project.

1.2.3 Confidential Filings Request

Certain sections and appendices of the Application contain operationally and commercially 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. Some of the Confidential Appendices also 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 confidential information as such, where applicable.

In accordance with the BCUC's amended Rules of Practice and Procedure established by Order G-15-19 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 as Appendix L-3.

1.3 *EXECUTIVE SUMMARY*

1.3.1 FEI Must Enhance its Integrity Management Capabilities to Mitigate the Risk due to Cracking on its CTS

The CTS TIMC Project is needed to enhance FEI's integrity management practices to mitigate cracking threats on 11 CTS pipelines, which have been identified as being susceptible to cracking.

As required by regulation, FEI manages threats to the integrity of its transmission pipeline systems in a proactive and systematic way through its IMP-P. However, integrity management practices continually improve as the industry learns more about the threats to pipelines and as it develops new tools and techniques to manage them. This is the case with the threat of cracking. Cracking is a threat to the safe operation of pipelines that has the potential to grow during the operation of a pipeline and lead to failures, including ruptures. The industry is learning that pipelines are more susceptible to cracking threats than previously believed, and industry practice is moving towards active monitoring and mitigating cracking threats on larger diameter pipelines using EMAT ILI tools. However, costly modifications to pipelines and related facilities can be required in order to enable the use of these tools.

Given the evolution of industry knowledge and practice related to cracking threats, FEI contracted JANA Corporation (JANA), a QRA expert, to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a QRA of the safety risks to FEI's transmission systems. JANA's assessment shows that 11 pipelines on the CTS, and nine on the ITS, are susceptible to cracking. Further, the QRA has shown that, at the system level, the safety risk is greatest on the CTS and that cracking is the greatest contribution to this risk. FEI has therefore prioritized work on the 11 CTS pipelines that are susceptible to cracking through the CTS TIMC Project.

Given FEI's obligations to ensure safe and reliable operation of its assets, the credibility of cracking threats to the CTS identified by JANA, the potential consequences of not addressing these threats, and emerging changes in industry practices, FEI as a prudent operator needs to enhance its transmission integrity management capabilities to mitigate cracking threats on the 11 CTS pipelines.

1.3.2 FEI Evaluated Several Alternatives and Selected EMAT ILI Program to Achieve Project Objective

Based on the Project need and justification set out in Section 3, the objective of the Project is to enhance FEI's integrity management capabilities to mitigate cracking threats to the 11 CTS transmission pipelines (Project Objective).

FEI examined six alternatives currently available, using non-financial and financial criteria, that could achieve the Project Objective as listed below in Table 1-1, and described in further detail in Section 4.

Table 1-1: Summary of Alternatives Evaluation

	Non-Financial Assessment	Technical Feasibility	Financial Assessment	Financial Feasibility
Alternative 1: SCCDA		Not Feasible		
Alternative 2: PRS		Not Feasible		
Alternative 3: HSTP		Not Feasible		
Alternative 4: EMAT ILI		**Feasible**		**Feasible**
Alternative 5: PLR		Potentially Feasible		Not Feasible
Alternative 6: PLE		Potentially Feasible		Not Feasible

Based on an assessment using the non-financial criteria, three alternatives were screened out as not technically feasible because they were unable to be implemented on the overall CTS in such a way as to sufficiently mitigate cracking threats, making them not technically feasible. Based on a financial assessment, two of the remaining three alternatives were screened out because they were not financially feasible due to high-level cost estimates approaching $2 billion, approximately six times the costs of the EMAT ILI alternative. EMAT ILI is the sole option which is both technically and financially feasible and is therefore the preferred alternative for the CTS TIMC Project

An exception to the above evaluation is the Noon's Creek to Burrard 508 segment of the Cape Horn to Burrard 508 transmission pipeline, which does not have the gas flow conditions required to move an ILI tool through the pipeline.[2] As such, FEI selected the pressure regulating station (PRS) alternative to manage and mitigate cracking threats on this segment.

1.3.3 Project Description, Timeline, Costs, and Rate Impacts

As described in Section 5, the Project consists of the work required to modify pipelines within FEI's existing rights of way and associated facilities to ready the CTS for EMAT ILI tools. This work includes the replacement of 13 heavy wall segments on six CTS pipelines, to enable the EMAT ILI tools to travel within its optimal velocity range. The work also includes alterations to 13 CTS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure, flow and backflow regulating capability, as needed to run the EMAT ILI tools.

Upon BCUC approval, FEI plans to initiate the detailed design and procurement activities in 2022. FEI will commence construction in Q1 2024 with Project completion and close-out activities to be completed by end of 2025. The detailed Project schedule and milestones are described in Section 5.3.9 of the Application.

The total capital cost estimate for the CTS TIMC project is $137.8 million (as-spent), which includes AFUDC. As described in Section 6 of the Application, the Project will result in an estimated cumulative delivery rate impact of 1.32 percent by 2026 when all construction is completed and all capital costs have entered FEI's rate base. The average annual delivery rate impact over the five years from 2022 to 2026 is estimated to be 0.26 percent annually or $0.013 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an average bill increase of approximately $1.19 per year over the five years, or $5.96 cumulatively by 2026.

1.3.4 FEI Will Account for Environmental and Archaeological Considerations

Section 7 provides an overview of the Project environment, including a discussion of the environmental and archaeological impacts that the Project may have and FEI's plans to mitigate those impacts.

Based on an Environmental Overview Assessment (EOA), FEI expects that the Project's scope, which is confined to existing rights of way and facilities, will have low to moderate environmental risks and any potential environmental impacts of the Project can be mitigated through the implementation of standard best management practices and mitigation measures.

FEI will be conducting an Archaeological Overview Assessment (AOA) in early 2021 to assess the Project's potential archaeological impacts. FEI also plans to conduct an Archaeological Impact Assessment (AIA) to further assess potential archaeological and cultural impacts within areas of moderate and high archaeological potential identified in the AOA. The AIA will provide

[2] As described in section 4.7, since the decommissioning of BC Hydro's Burrard Thermal Generating Station in 2016, this transmission pipeline is now primarily used to supply Port Moody residential customer load which is significantly less than the design capacity of the pipeline.

a detailed assessment to allow for development of site-specific mitigation strategies to offset any potential impacts associated with the Project.

1.3.5 FEI's Public Consultation and Indigenous Groups Engagement Efforts to Date are Sufficient and Will Continue

Section 8 discusses FEI's stakeholder and public consultation and communication efforts regarding the Project and FEI's consultation with Indigenous groups potentially impacted by the Project. FEI has developed an overarching Consultation and Engagement Plan to ensure stakeholders and Indigenous groups are informed and engaged about the Project.

FEI's consultation and engagement has been sufficient to date, reflecting the Project's scope within existing rights of way and within FEI premises. FEI has recorded questions, issues, and concerns from Project stakeholders and Indigenous groups and will continue engaging with these groups by keeping lines of communication open as the Project advances. FEI will incorporate feedback as the Project progresses and will continue to work with stakeholders and Indigenous groups to address any outstanding interests and issues throughout the lifecycle of the Project, including through the Project's planning, construction and restoration phases.

1.3.6 Conclusion

FEI submits that the Project is in the public interest and should be approved as set out in the Application.

1.4 *PROPOSED REGULATORY PROCESS*

FEI proposes the following preliminary regulatory timetable:

Table 1-2: Proposed Preliminary Regulatory Timetable

ACTION	DATE (2021)
BCUC Issues Procedural Order	Week of February 22
FEI Publishes Notice by	Thursday, March 11
Intervener Registration	Thursday, March 25
FEI Workshop	Thursday, April 15
BCUC and Intervener Information Request No. 1	Thursday, April 29
FEI Response to Information Request No. 1	Tuesday, June 1
Submissions on Further Process	Tuesday, June 15

FEI is proposing a workshop subsequent to intervener registration and prior to the first round of information requests. This workshop will allow FEI to visually present the CTS TIMC Project to the BCUC and interveners, to be followed by a question and answer session. FEI is proposing that the workshop be followed by a round of information requests and then submissions on further process.

1.5 ORGANIZATION OF THE APPLICATION

The Application provides detailed information in support of the Project. The remainder of the Application is organized into the following sections:

- **Section 2** provides an overview of FEI, and its financial and technical capabilities to carry out the Project.
- **Section 3** describes the need and justification of the Project, including that:
    - cracking is a threat to the integrity of transmission pressure pipelines on FEI's system that can lead to significant safety and other consequences;
    - FEI has identified and correctly prioritized the need to mitigate the threat of cracking on 11 pipelines in its CTS based on the quantitative assessment of the safety risk; and
    - to maintain compliance with regulations and standards and align with evolving industry practice, FEI must enhance its transmission integrity management capabilities to mitigate cracking threats on the 11 CTS pipelines.
- **Section 4** describes the alternatives evaluation process, including alternatives considered, alternatives analysis methodology, alternatives screened out for feasibility, and the basis for selecting EMAT ILI as the preferred alternative.
- **Section 5** provides a detailed description of the Project, including design, construction, resource planning and management, schedule and basis of the cost estimate, as well as setting out a risk analysis and discussing potential Project impacts.
- **Section 6** provides the Project 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 archaeological impacts that the Project may have, and FEI's plans to mitigate those impacts.
- **Section 8** discusses FEI's communication efforts and consultation with the public and stakeholders regarding the Project, including FEI's engagement with Indigenous groups potentially impacted by the Project.
- **Section 9** describes how the Project supports BC's energy objectives, including the Project's positive impact on economic development and employment, as well as how the Project aligns with FEI's most recent long-term gas resource plan.
- **Section 10** concludes that the Project is in the public interest and should be approved.

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. 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 residential, commercial, and industrial customers in more than 100 communities throughout British Columbia, with more than 1 million customers served throughout British Columbia. FEI's distribution network provides more than 95 percent of the natural gas energy delivered to 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 DBRS Morningstar 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 approximately 50,000 kilometres of natural gas transmission and natural gas distribution mains and service lines in British Columbia. FEI has completed other large natural gas projects, and has the technical capacity to complete the Project.

2.4 COMPANY CONTACT

Diane Roy
Vice President, Regulatory Affairs
FortisBC Energy Inc.
16705 Fraser Highway
Surrey, B.C. V4N 0E8

Phone:	(604) 576-7349
Facsimile:	(604) 576-7074
E-mail:	diane.roy@fortisbc.com
Regulatory Matters:	gas.regulatory.affairs@fortisbc.com

2.5 *LEGAL COUNSEL*

Christopher Bystrom
Fasken Martineau DuMoulin LLP
2900 – 550 Burrard Street
Vancouver, B.C. V6C 0A3
Phone: (604) 631-4715
Facsimile: (604) 631-3232
E-mail: cbystrom@fasken.com

3. PROJECT NEED AND JUSTIFICATION

3.1 *INTRODUCTION AND OVERVIEW*

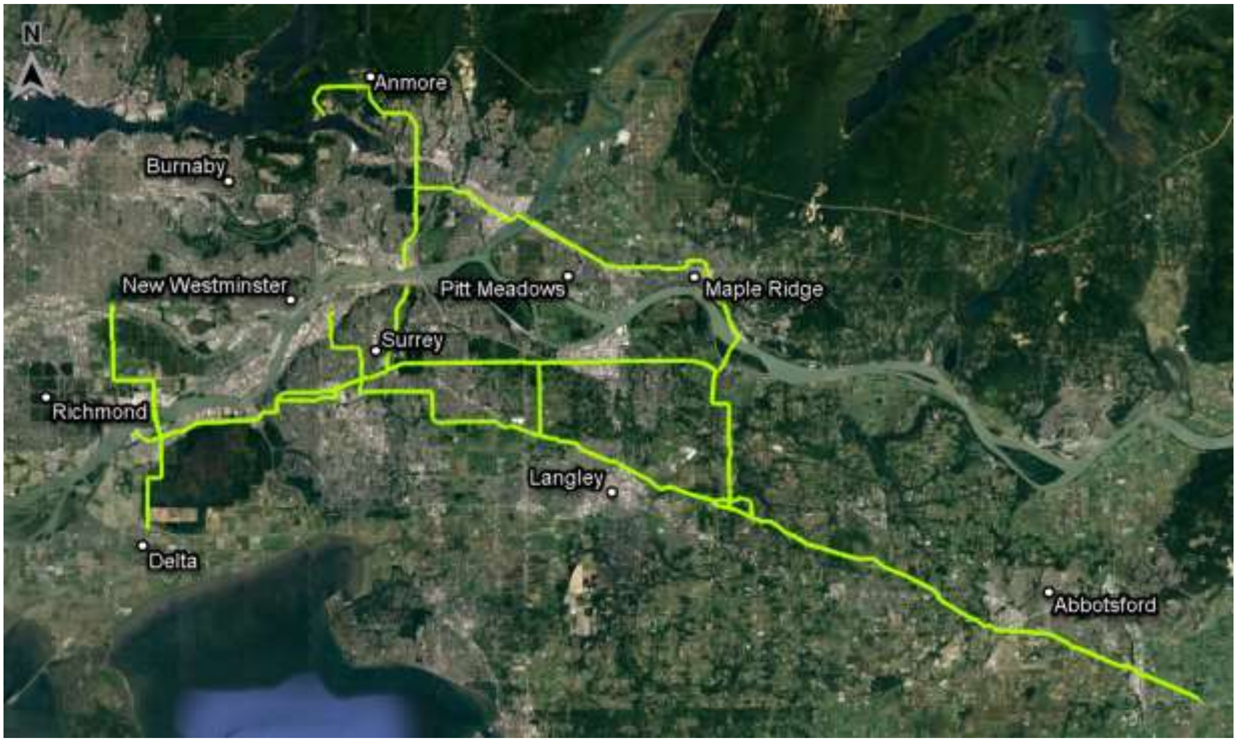
In this section, FEI describes the need for the Project, which is to enhance FEI's integrity management practices to mitigate cracking threats on 11 pipelines in its CTS that are susceptible to cracking.

As required by regulation, FEI manages threats to the integrity of its transmission pipeline systems in a proactive and systematic way through its Integrity Management Program – Pipeline (IMP-P). However, integrity management practices continually improve as the industry learns more about the threats to pipelines and as it develops new tools and techniques to manage them. This is the case with the threat of cracking. Cracking is a threat to the safe operation of pipelines that has the potential to grow during the operation of a pipeline and lead to failures, including ruptures. The industry is learning that pipelines are more susceptible to cracking threats than previously believed, and industry practice is moving towards active monitoring and mitigating cracking threats on larger diameter pipelines using electro-magnetic acoustic transducer (EMAT) in-line inspection (ILI) tools. However, costly modifications to pipelines and related facilities can be required in order to enable the use of these tools.

Given the evolution of industry knowledge and practice related to cracking threats, FEI contracted JANA Corporation (JANA), a QRA expert, to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a QRA of the safety risks to FEI's transmission systems. JANA's assessment shows that 11 pipelines on the CTS, and nine on the Interior Transmission System (ITS), are susceptible to cracking. Further, the QRA has shown that, at the system level, the safety risk is greatest on the CTS and that cracking is the greatest contribution to this risk. FEI has therefore prioritized work on the 11 CTS pipelines that are susceptible to cracking through the CTS TIMC Project.

Given FEI's obligations to ensure safe and reliable operation of its assets, the credibility of cracking threats to the CTS identified by JANA, the potential consequences of not addressing these threats, and emerging changes in industry practices, FEI as a prudent operator needs to enhance its transmission integrity management capabilities to mitigate cracking threats on the 11 CTS pipelines. Figure 3-1 below is a map of the CTS pipelines within the scope of this Project.

Figure 3-1: 11 CTS Pipelines Requiring System-Level Cracking Mitigation



In the following sections, FEI explains the Project need and justification in detail, as follows:

- Section 3.2 describes how pipeline integrity is initially established during design, manufacturing, installation, and commissioning, and is then monitored and maintained by FEI using activities such as ILI. This section also describes how cracking is a threat to FEI's pipelines, but FEI's current integrity management practices do not provide the capability of identifying all instances of cracking.
- Section 3.3 outlines how industry knowledge and practice with respect to cracking threats are evolving, that cracking threats are more pervasive than previously believed, and that ILI tools have been developed that can detect cracking on FEI's system.
- Section 3.4 provides an overview of JANA's risk assessment of FEI's transmission system, confirming that transmission pipelines on FEI's CTS and ITS are susceptible to cracking that can lead to failure. Furthermore, a QRA shows that, at the system level, the safety risk is greatest for the CTS and cracking threats are the largest contributor to this risk.
- Section 3.5 describes FEI's obligation to enhance its transmission integrity management capabilities to mitigate the safety risk posed by cracking threats to the 11 CTS pipelines. As a prudent operator, FEI must respond to the risk of cracking and keep pace with evolving industry practice for managing this risk.
- Section 3.6 summarizes the Project need and justification.

3.2 *PIPELINE INTEGRITY MANAGEMENT CONCEPTS CENTRAL TO UNDERSTANDING NEED AND JUSTIFICATION FOR PROJECT*

3.2.1 Summary of Section

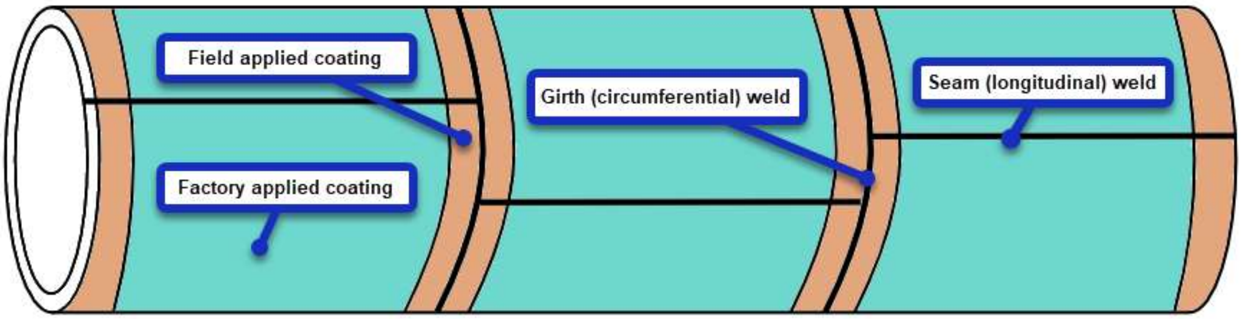
This section provides the necessary background information on pipeline integrity management, which is central to understanding the need and justification for the Project. Pipeline integrity management is the “cradle-to-grave” management of a pipeline’s suitability for continued safe, reliable, and environmentally responsible delivery of natural gas. As described in detail below, the integrity of a pipeline is initially established through its design, manufacturing, installation, and commissioning, and that integrity is then monitored and maintained during its operation. FEI’s IMP-P covers ILI and all other aspects of pipeline integrity management, including identifying and monitoring ongoing hazards and threats[3] to the integrity of FEI’s pipelines through various activities. ILI is an industry-preferred integrity management methodology as it provides active monitoring of ongoing threats. FEI’s ILI capabilities have been expanding as new ILI tools are developed to monitor different threats and various diameter pipelines. Cracking, including stress corrosion cracking (SCC) and crack-like imperfections in the seam weld of pipelines, is a threat to pipelines, but FEI’s existing integrity management tools cannot detect all instances of such cracking.

3.2.2 Integrity of Pipelines is Established During Design, Manufacturing, Installation and Commissioning

The integrity of a pipeline is initially established through the engineering design, manufacturing, installation and commissioning processes. Engineering design must not only reflect regulations and adopted standards, but must also anticipate and provide necessary integrity management capabilities. Design processes establish important specifications pertaining to manufacturing, installation, and commissioning. The following subsections describe the manufacture of pipelines in FEI’s transmission systems and the steps taken after manufacturing to ensure their ongoing integrity. Figure 3-2 provides a reference for the pipeline features and terminology discussed in this section.

[3] Hazards and threats are used synonymously, but it is common practice to use one or the other depending on the context. E.g., it is common to refer to “natural hazards” and “cracking threats,” but not “natural threats” and cracking hazards.”

Figure 3-2: Typical Pipeline Features



3.2.2.1 *Modern Pipe Manufacturing Processes Result in Superior Pipe Materials*

Steel and pipe manufacturing practices and processes have continually evolved and significant improvements have occurred since the early 1970s. Pipe manufactured prior to 1970 is often referred to as "vintage" pipe and pipe manufactured after 1970 is referred to as "modern" pipe. Vintage pipe can contain a larger quantity of manufacturing anomalies, with the majority of these anomalies occurring in the seam welds, which are also referred to as longitudinal welds. The quantity of manufacturing anomalies also varies with pipe manufacturer. Types of manufacturing anomalies are further discussed in Section 3.2.4.2.

The majority of pipe in FEI's transmission systems was manufactured using one of two processes:

1. **Electric Resistance Welding**
   The majority of pipelines in FEI's transmission systems that are nominal pipe size (NPS) 18 and smaller were manufactured using the electric resistance welding (ERW) process. The ERW process uses an electric current to bond two edges of steel to form a cylindrical pipe. This process was described in a publication by the American Society of Mechanical Engineers (ASME)[4] as follows: ERW "is manufactured by cold-forming previously-hot-rolled strip to a circular shape, heating the two abutting edges by passing electric current through the interface as the edges come together, and effecting a bond between the edges as the molten or near-molten edges are forced together by mechanical means without the addition of any filler metal." While the pipe is still hot, the material pushed out at the bond line, where the two edges of steel meet, is removed from the internal and external surfaces of the pipe, leaving both surfaces flat.

   There are two categories of ERW:

   a. Low frequency ERW (LFERW), for pipe manufactured prior to 1970; and

[4] J. Kiefner and E. Clark, *History of line pipe manufacturing in North America.* New York, N.Y: American Society of Mechanical Engineers, 1996.

b. High frequency ERW (HFERW), typically available post-1970 (although there is a period around 1970 where pipe was manufactured using both processes).

Low and high frequency refers to the frequency of the alternating electrical current used to heat the pipe edges prior to forming the weld.

2. **Submerged Arc Welding**

The majority of pipelines in FEI's transmission systems larger than NPS 18 were manufactured using the submerged arc welding process. In this process, the pipe is made by arc welding, using a filler material to bond the edges of cylinders that are cold-formed using previously hot rolled steel plates. The seam weld cap is not removed from the pipe, leaving a slight protrusion on the inside and outside surfaces at the seam weld.

There are two categories of submerged arc welding:

a. Single submerged arc weld (SAW)

b. Double submerged arc weld (DSAW)

The primary difference between SAW and DSAW welding is that the pipe seam is welded from only the outside surface in SAW pipe and from both the inside and outside surfaces in DSAW pipe.

Seam welds, regardless of whether they are ERW, SAW, or DSAW, are performed in a pipe manufacturing facility, commonly referred to as a pipe mill. Once manufactured, each pipe segment is subjected to a short-duration hydrostatic test at the pipe mill, also referred to as a "mill test". Mill testing at the pipe mill and hydrostatic testing prior to commissioning both involve filling the pipe with water, increasing the pressure of the water in the pipe to a predetermined test level, and holding that pressure for a specified period of time. Mill tests use a pressure and duration specified in the pipe standard used at the time of manufacturing. The purpose of this test is to validate that the pipe segment will perform as expected during its useful life and to identify and remove any significant defects present in the pipe from the manufacturing process, which will fail during the test and allow the operator to replace the affected segment. A mill test does not replace the need for a subsequent hydrostatic test prior to commissioning (described further in Section 3.2.2.3 below).

3.2.2.2 *External Coatings and Electric Current Help Protect Steel Pipelines From Degrading Over Their Lifecycle*

When bare steel is exposed to moisture and oxygen in soil, it can begin to rust, resulting in patches of corrosion. To protect against corrosion and other related threats, the bare steel manufactured pipeline segments are coated. Coatings can be made of various materials, such as plastic or epoxy, and act as a barrier between the steel pipe surface and the soil. Generally, this coating is applied in a controlled environment, such as in a coating shop, and is commonly referred to as "factory coating".

The coated pipe lengths are transported to the installation location and welded together. Welds connecting pipe segments (referred to as "girth welds"), run around the circumference of the pipeline, and are typically performed in field conditions during pipeline construction. The girth welds completed at the installation location are coated using a field-applied coating, and then the pipeline is buried.

Once buried, the pipeline is hydrostatically tested, and cathodic protection is applied. Cathodic protection involves applying an electric current to the pipeline to minimize the natural corrosion tendency of buried steel. Cathodic protection provides a secondary defence where imperfections in the pipeline coating, such as holes or disbonded areas, may exist.

3.2.2.3 *Hydrostatic Tests Ensure Pipeline Integrity at the Time of Installation*

Once a pipeline has been constructed, coated and buried, it is subjected to a hydrostatic test prior to being placed in service. This hydrostatic test is in addition to the mill test described in section 3.2.2.1. The pipeline is pressurized to the level and duration set out in the pipeline code in effect at the time of construction. The minimum test pressure is based on the required test factor. The test factor must be greater than 1.0 to achieve a safety margin above the maximum operating pressure.

$$Test\ Factor = \frac{Minimum\ Hydrostatic\ Test\ Pressure}{Maximum\ Operating\ Pressure}$$

Subjecting the pipeline to pressures above the maximum operating pressure as part of a pre-commissioning hydrostatic test will cause any significant manufacturing, transportation and construction defects to fail. If a failure occurs, the segment of pipe that failed is exposed, replaced, and the hydrostatic test is performed again. A pipeline is put into service only after it has passed the hydrostatic test, thus validating the integrity of the pipeline at installation.

For gas pipelines, studies have established, and standards have adopted, that a minimum test pressure of 1.25 times the maximum operating pressure is sufficient to identify and remove initial manufacturing and construction flaws that could grow to failure through fatigue. As a result, manufacturing imperfections that survive the hydrostatic test are typically considered benign or stable, unless they occur in conjunction with other integrity-related threats – such as external corrosion, dents, or gouges – thereby resulting in a combined effect that may pose a threat to pipeline integrity.

3.2.2.4 *Pipelines Operating at Transmission Pressure Experience High Hoop Stress Levels That Require Ongoing Oversight*

During operation, gas flowing through the pipeline exerts a consistent pressure on the pipeline (indicated as $P_{internal}$ in Figure 3-3). This pressure results in a circumferential tensile stress, called hoop stress (S_{hoop}) within the pipe steel that tries to pull the pipe apart. Hoop stress makes up a majority of internal pressure-induced stress, with the remainder of stress occurring in the longitudinal direction ($S_{longitudinal}$), which is typically half the hoop stress (see Figure 3-4).

Figure 3-3: Profile view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in hoop stress within the pipeline steel

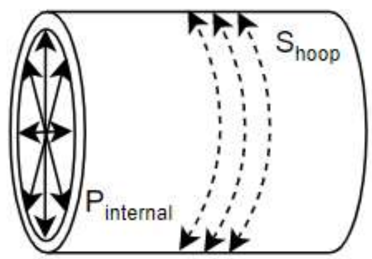


Figure 3-4: Profile view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in longitudinal stress within the pipeline steel

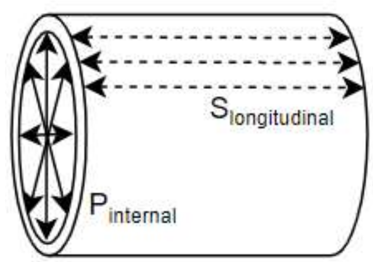
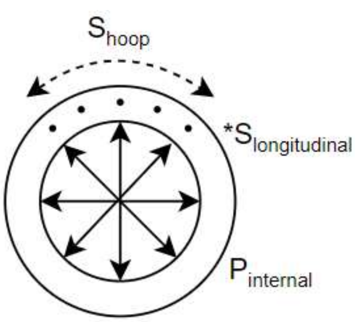


Figure 3-5: Cross section view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in hoop and longitudinal stresses within the pipeline steel



*into and out of the page

Hoop stresses are counteracted by the strength of the steel material and the wall thickness of the pipe, which ensures that the pipeline can contain the pressurized gas. Typically, if a higher-grade material is used, the pipe wall can be thinner. However, the wall of a pipeline may thin over time due to pipe condition hazards such as corrosion or physical damage due to third-party contacts, if not protected and monitored. As discussed in Section 3.2.2 below, FEI's activities under its IMP-P are intended to ensure that the pipe wall does not thin to the point that the hoop stress can no longer be restrained, and hence cause a pipeline failure.

3.2.3 FEI Monitors and Maintains Integrity of Pipelines During Their Operation

As discussed in this section, throughout their operation, pipelines may be exposed to hazards and threats, such as corrosion and cracking, that can undermine their integrity. However, with an effective integrity management program, hazards and threats can be managed to keep pipelines operating safely and reliably indefinitely.

3.2.3.1 Hazards and Threats to FEI's Pipelines Need to be Monitored and Managed

While the integrity of the pipeline is proven at the time of installation through the hydrostatic test, it needs to be validated and confirmed over time due to ongoing integrity threats. Hazards and threats to FEI's transmission pipelines include:

Third-Party Damage: is the result of external interference such as third-party contact with the pipeline, or vandalism;

- **Natural Hazards:** may be the result of geotechnical (e.g., landslide), hydrotechnical (e.g., flood) and seismic (e.g., earthquake) causes. Natural hazards can cause a pipeline to become exposed or move from its installation location;
- **Pipe Condition:** includes conditions such as metal loss (e.g., external corrosion) and cracking (e.g., SCC). These conditions can be time-dependent, meaning they may have the potential to grow to failure during the operation of the pipeline, and must be monitored;
- **Material Defects and Equipment Failures:** includes features introduced during the pipe manufacturing process (e.g., defective seam weld), and failures related to other equipment such as valves, gaskets, etc.; or
- **Human Factors:** includes hazards resulting from human error, such as construction errors (e.g., defective welds, dents, buckles) or operational errors.

These threats and hazards can be:

- **Time-dependent:** their potential to impact the pipeline can increase over time if they are not appropriately mitigated (e.g., corrosion and cracking).
- **Time-independent:** their potential to impact the pipeline can vary, but on a random basis and not linked to the passage of time (e.g., third-party damage and natural hazards); or
- **Stable:** their potential, in and of themselves, to impact the pipeline will not change over time (e.g., manufacturing and construction imperfections that pass mill and pre-commissioning hydrostatic tests for a typical natural gas pipeline).

All hazards have the potential to undermine the integrity of the pipeline and are controlled by physical and operational barriers. Physical barriers include depth of cover (i.e., how deep the pipeline is buried) and engineering design considerations, such as pipe wall thickness and material grade. Operational barriers include pipeline patrols, cathodic protection, ILI, and preventative maintenance programs. Hazards that can be identified and prevented prior to installation are managed through quality control processes such as pressure testing; however, most hazards are monitored through operational barriers.

FEI's IMP-P, which documents hazards and barriers applicable to FEI's pipeline system, is outlined in the following section.

3.2.3.2 *Overview of FEI's Integrity Management Program – Pipeline (IMP-P)*

FEI manages the integrity of its transmission pipeline systems with its IMP-P. FEI's IMP-P meets the requirements of the BC *Pipeline Regulation* under the *Oil and Gas Activities Act* (OGAA). The *Pipeline Regulation* requires FEI to employ a quality management system with a plan-do-check-act (PDCA) cycle designed to promote continual improvement of its integrity management activities. Implementation of a quality management system, founded on PDCA principles, is the internationally recognized way for an industry to improve its asset performance and reduce failures over the life of assets. As such, it has been embedded within Canadian pipeline regulations, standards and industry practices.

FEI's IMP-P is a quality-driven program that anticipates, plans for and establishes practices for the management and mitigation of conditions that could adversely affect safety, reliability, or the environment during an asset's lifecycle. Examples of activities within the scope of FEI's IMP-P include the following:

- Design, material selection, and procurement;
- Construction, including installation, inspection, and quality assurance and control;
- Operations and maintenance, which includes:
  - Vegetation management and pipeline patrol for preventing third-party damage;
  - Water crossing inspections and seismic mitigation for preventing failures due to natural hazards; and
  - Pipeline condition monitoring using ILI for detecting and sizing of geometric imperfections (e.g., dents, wrinkles, and buckles) and metal loss imperfections (e.g., corrosion and gouges).
- Emergency preparedness, response, and recovery; and
- Risk management.

As part of FEI's implementation of its IMP-P, integrity management decisions, such as determining the appropriateness and timing of undertaking continual improvement activities, are made based on FEI's analysis of various inputs and factors. These inputs and factors can include regulations, standards, industry practice, other transmission operators' experiences, FEI asset knowledge (e.g., condition data, system capacity demands, population around the pipeline, and risk assessment outputs), and availability of technologies. These inputs and factors have changed and will continue to change over time. For example:

- Integrity management standards have evolved over the past two decades. Integrity management program requirements were first published in the Canadian Standards Association (CSA) Z662 Oil and Gas Pipeline Systems standard in 2005. While operators have been mitigating hazards to their pipelines since their original construction, the standards for integrity management programs formalized these operating activities into a management system framework with increased focus on performance monitoring and continual improvement.
- Industry practice has also evolved, particularly with respect to condition monitoring activities, with the increasing availability and widespread adoption of ILI technologies by operators as part of their integrity management efforts.
- Public and regulatory expectations have changed in parallel with the industry's efforts to manage their aging transmission pipelines. All unplanned pipeline releases are subject to public scrutiny and regulatory inquiry. Incidents with the potential for significant consequences, such as pipeline ruptures, are not acceptable to regulators, the public, or FEI.

As these inputs and factors change, and as FEI's pipelines continue to age, FEI must continue to improve its IMP-P activities and ensure the safety and reliability of its pipeline system.

3.2.3.3 *Overview of FEI's ILI Program*

ILI is a common industry-preferred integrity management methodology. It involves inserting a tool inside a pipeline, which is propelled through the line using the existing gas flow, for the purpose of collecting data on the pipe's condition. ILI provides cost-effective integrity management because it identifies imperfections or defects at site-specific locations that can be repaired, reducing the need for large-scale and costly system-level pipeline rehabilitation efforts (such as pipeline replacement). ILI also enables proactive asset management by providing condition data, including changes over time, which can inform long-term asset planning.

FEI has a long history of using ILI to manage the integrity of its transmission pipeline system. FEI has been utilizing geometry and magnetic flux leakage (MFL) tools since the late 1980s. Geometry tools are capable of detecting and sizing geometric imperfections such as dents, wrinkles, and buckles. MFL tools are used for detecting and sizing three-dimensional metal loss defects, including corrosion and gouges. More recently, the industry developed circumferential magnetic flux leakage (CMFL) tools to address limitations in the capabilities of MFL tools to detect and size long, narrow, longitudinally-oriented metal loss.

FEI has been conducting baseline surveys of its pipeline system using CMFL tools since 2014. Photos of the different ILI tools are shown below in Figure 3-6.

Figure 3-6: Examples of ILI Tools (Source: ROSEN)

(a) Geometry Tool[5]

(b) MFL Tool[6]

(c) CMFL Tool[7]

---

[5] *Dent Assessment: Stress Based Assessment of Denting and Buckling.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/dent-assessment/Rosen-Group_Dent-Assessement/ROSEN-GROUP_DENT-ASSESSMENT.pdf

[6] *RoCorr MFL-A Service: In-Line High Resolution Metal Loss Detection and Sizing.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rocorr-mfl-a/ROSEN-GROUP_ROCORR-MFL-A_SERVICE.pdf

As ILI technology has developed for smaller pipeline diameters, FEI has undertaken two significant projects over the past 20 years to expand its ILI capabilities:

- **Transmission Pipeline Integrity Plan (TPIP**): From 2000 to 2005, the TPIP expanded FEI's ILI capabilities for geometric and metal-loss imperfections to all larger-diameter transmission pipelines, primarily focused on lines of diameter greater than NPS 10.
- **Inland Gas Upgrade (IGU):** From 2020 to its expected construction completion in 2024, the IGU will expand FEI's ILI capabilities for geometric and metal loss imperfections to smaller diameter transmission pipelines, focused on lines of diameter as small as NPS 6 (limited by the availability of proven and commercialized ILI tools).

Operators and integrity-related service providers (e.g., ILI and leak detection vendors) have invested significantly in the development of technology to support the ongoing management of integrity hazards, as evidenced by the existence of new tools and technology on the market. In recent decades, significant technological development has occurred in the area of ILI, including most recently, the development and commercialization of EMAT ILI tools that are capable of detecting and sizing certain types of cracking and other two-dimensional defects. At the time of this Application, EMAT tools suitable for FEI's natural gas pipelines of NPS 10 and larger have been sufficiently commercialized.

For ILI tools to be suitable for FEI's pipelines, they must be able to operate within the variable flow rates on FEI's system. Unlike many other gas transmission systems where flow is dependent on the daily volumes contracted by midstream shippers, the flow through the FEI transmission system is almost entirely dependent on FEI's customer demand, which is temperature sensitive. During peak winter months (typically November through March), gas flows in FEI's transmission pipelines are high compared to the shoulder and light-load seasons (typically approximately April to October). For this reason, FEI has limited windows during which it can run ILI tools. During high demand – and even some lighter load – periods, gas flow rates can be sufficiently high that the ILI tool travels through the pipe at an excessive speed and hence cannot collect valid data. Recently, newer ILI tools have been developed which allow a variable portion of the gas flow to bypass the tool as it travels through the pipe. This allows the tool to control its own speed in real time to ensure consistent collection of high-quality data. Given the widely varying flow rates in FEI's system, it is expected that the use of these newer speed-control tools will be required in many instances.

Table 3-1 summarizes the primary ILI tools adopted by industry and their respective capabilities.

---

[7] *RoCorr MFL-C Service: In-Line High Resolution Metal Loss and Narrow Axial Feature Analysis.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rocorr-mfl-c/ROSEN-GROUP_ROCORR-MFL-C-SERVICE.pdf

Table 3-1: Summary of ILI Tool Feature Detection Capabilities

	Geometry	MFL	CMFL	EMAT
Dents	✓			
Wrinkles / Buckles	✓			
Metal loss		✓ (circumferentially-oriented features)	✓ (narrow longitudinally-oriented features)	
Long seam weld location			✓	✓
Girth weld location	✓	✓	✓	✓
SCC and crack-like features				✓
Longitudinal seam weld flaws				✓

3.2.4 Cracking Threats to FEI's System

Cracking threats are considered "planar imperfections" that, due to a lack of volume, cannot be detected by FEI's current ILI tools. Cracks have a measurable length and depth, but are sufficiently narrow that they do not typically have a measurable width associated with their dimensions. Cracking threats affect the strength of a pipeline by effectively reducing the wall thickness of the pipeline. The two main types of cracking threats to FEI's system are SCC and crack-like imperfections in the seam weld of a pipeline. In addition, SCC and crack-like imperfections can interact with other time-dependent integrity threats, such as external corrosion, to compound integrity issues on a pipeline.

3.2.4.1 *Stress Corrosion Cracking*

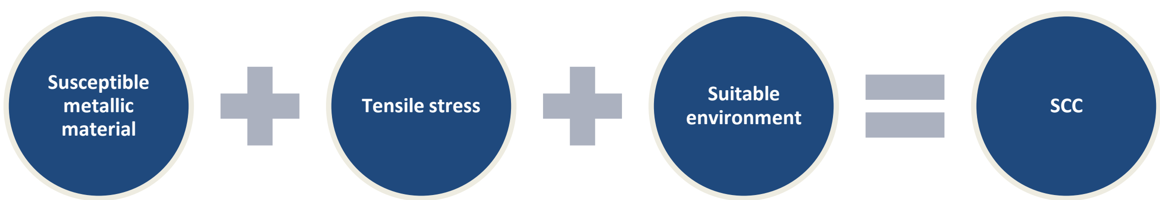
SCC is defined as "cracking of a material produced by the combined action of corrosion and tensile stress (residual or applied)."[8] The difference between residual and applied stresses is explained in the table below.

[8] CEPA Pipeline Integrity Working Group, "CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015.

Table 3-2: Residual and Applied Stresses

Residual Stresses	Applied Stresses
May be imparted in a pipeline from: ○ **Original pipe manufacture, as forces are applied when bending the original flat steel plate into a cylinder.** ○ Construction, as force may need to be applied to achieve the correct spacing and alignment when preparing two segments of pipe for a field weld.	**Are imparted during operation and include:** ○ Hoop stresses, resulting from the forces inside of the pipeline acting in an outward direction (see Figure 3-2). ○ Longitudinal stresses, resulting from forces acting along the length of the pipeline (see Figure 3-3), such as could occur due to ground movement.

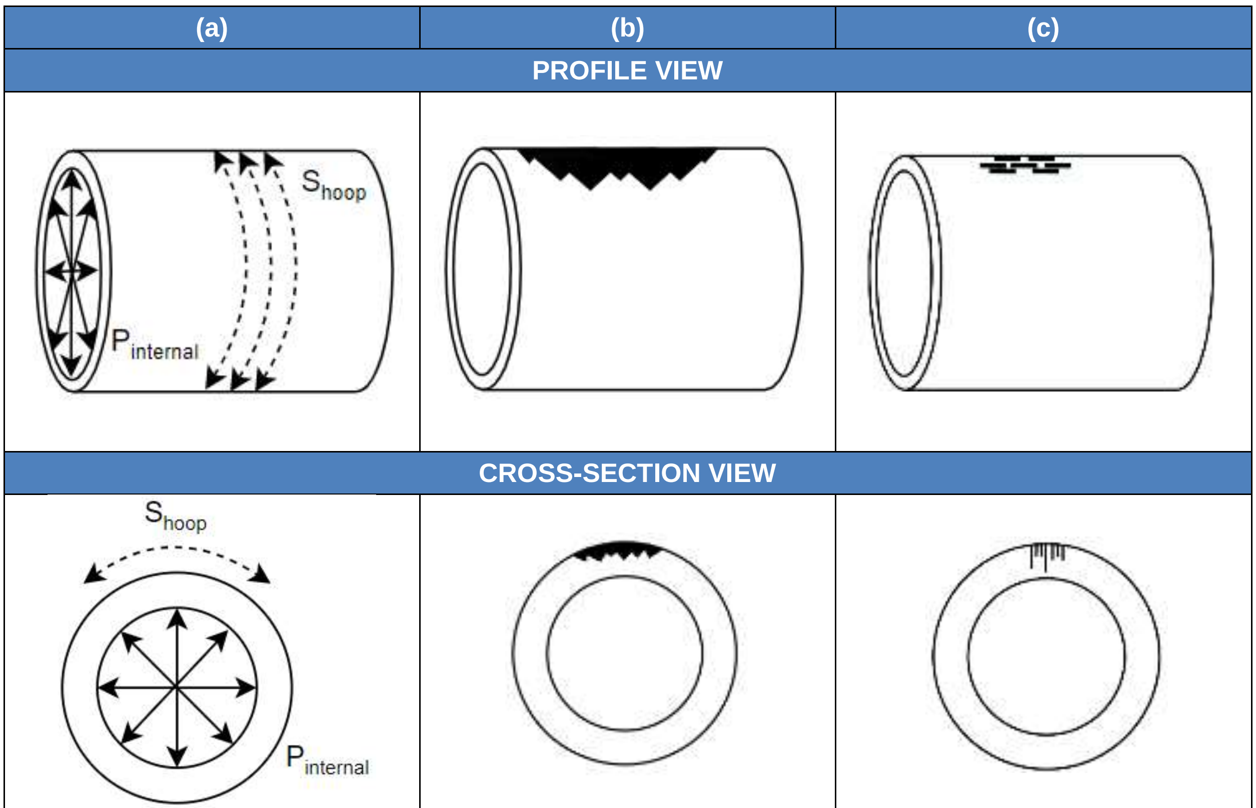
SCC occurs on transmission pipelines as a result of the combination of three factors:**Error! Bookmark not defined.**



1. **Susceptible metallic material**: All pipeline steels are considered susceptible materials, although it is expected that susceptibility amongst steels will vary depending on when they were manufactured (e.g., pre-1980s steel is expected to be more susceptible).
2. **Tensile stress**: This may include residual or applied stresses. Tensile stress is often referenced as a percentage of the specified minimum yield stress (SMYS) of a pipe, which is the minimum stress that will cause a pipe to permanently deform.
3. **Suitable environment**: A suitable environment may be present if:
    - Uncoated steel, resulting from coating damage or where coating has disbonded and come away from the pipe, is exposed to the surrounding soil. SCC can occur in the range of soil types and terrain/drainage conditions found in FEI's operating territory.
    - Other conditions for corrosion exist, such as cathodic protection (CP) shielding or where there are inadequate levels of CP. CP shielding can occur due to disbonded coatings, large rocks, or foreign structures preventing the CP current from reaching the pipeline, and which in turn contributes to a corrosive environment where corrosion and/or SCC may initiate and grow.

SCC, like corrosion, is a time-dependent integrity threat, meaning that its potential to impact the pipeline may increase over time if not appropriately mitigated. SCC may or may not form in conjunction with corrosion. As described by the Canadian Energy Pipeline Association (CEPA), "*SCC initiates on the external surface of the pipe and grows in both depth and length*," with shorter cracks having the potential to coalesce and become a greater threat.[9] Figure 3-7 below compares the effects of SCC and corrosion on a pipe wall against steel without flaws or defects. If SCC occurs in combination with other hazards and threats, such as external corrosion, there can be a higher potential for a pipeline failure.

Figure 3-7: Illustrations of Corrosion and Cracking, Showing (a) Steel without Flaws or Defects, (b) External Corrosion and (c) SCC



DESCRIPTION		
Steel pipe without flaws or defects; internal gas pressure results in hoop stresses in pipe wall	Steel pipe with external corrosion	Steel pipe with stress corrosion cracking

3.2.4.2 *Crack-Like Imperfections in Seam Welds*

There are a number of crack-like imperfections associated with seam welds that – when occurring in conjunction with mechanical damage, such as dents, or other time-dependent integrity threats such as metal-loss corrosion – could grow to failure under normal operating

[9] Canadian Energy Pipeline Association, *CEPA Recommended Practices for Managing Nearneutral pH Stress Corrosion Cracking*, 3rd edition, May 2015, prepared by CEPA Pipeline Integrity Working Group. Online: https://www.cepa.com/wp-content/uploads/2016/11/Stress-Corrosion-Cracking_3rdEdition_CEPA_FINAL.pdf

conditions. These imperfections are related to the way the pipe is manufactured. As described in Section 3.2.2.1, most of FEI's transmission pipelines have been manufactured by either ERW or submerged arc welding (SAW and DSAW). The seam weld imperfections that could arise from these manufacturing processes are listed below.

- Potential imperfections in ERW seam welds:
  - Lack of fusion;
  - Inclusions; or
  - Hook cracks.
- Potential imperfections in SAW and DSAW seam welds:
  - Toe cracks; or
  - Transit fatigue.

More information on these seam weld-related imperfections can be found in Appendix A.

3.2.5 FEI's Existing Integrity Management Practices Do Not Identify All Cracking

FEI's current integrity management practices for managing cracking threats involve the inspection of its transmission pipelines for cracking during "opportunity digs", when the pipeline is exposed because of other pipe condition assessments. These digs are referred to as "opportunity digs," as the primary reason for the integrity dig is not related to cracking. These integrity digs are scheduled for other reasons, including the following:

- To assess metal loss anomalies (e.g., corrosion) identified through ILI and to repair or replace if necessary;
- To assess mechanical damage anomalies (e.g., dents, gouges) identified through ILI and to repair or replace if necessary; and
- To assess sites identified through above-ground surveys of its pipelines without ILI capability and to repair or replace if necessary.

During an integrity dig, in addition to the primary anomaly assessment (e.g., visual analysis, measurement, and assessment of the corrosion, dent, or gouge), FEI performs an industry-standard, non-destructive evaluation methodology called magnetic particle inspection (MPI). MPI provides a visual indication of microscopic imperfections along the exposed surface of the steel pipe, which may be indicative of cracking. FEI addresses any cracking through pipeline repairs or replacement, as necessary, and records any SCC-related findings for future tracking. Through these digs FEI is aware of the existence of cracking threats on its system and has been monitoring such threats on its transmission pipeline system as part of its IMP-P.

FEI estimates that the total amount of pipeline exposed to date as part of the Integrity Dig Program (and hence assessed for cracking) is less than one percent of the total length of pipe in FEI's transmission system. As such, these opportunity digs are not expected to have identified all cases of cracking due to the limited lengths that have been exposed relative to the full length of buried pipelines.

As cracking is a highly localized and often unpredictable phenomenon, it is also not possible to use the analysis from integrity digs to determine where cracking may be occurring on other segments of FEI's pipelines. Crack initiation and growth is a complex function of a number of factors.[10] As described in Section 3.2.4.1, SCC requires the presence of three factors: a susceptible material, a tensile stress, and a suitable environment. The degree of contribution from each of these factors varies such that SCC found at one location cannot be relied upon for locating SCC at other locations. As such, it is not possible to pinpoint the exact locations where SCC will occur simply through assessing the factors that cause it. FEI's current practices therefore do not provide the capability of identifying all instances of cracking on FEI's pipelines.

3.3 *INDUSTRY KNOWLEDGE OF CRACKING THREATS AND MEANS TO MITIGATE THEM ARE IMPROVING*

3.3.1 Summary of Section

A primary driver for the Project is the evolution of industry knowledge about cracking threats and industry practice on how to manage those threats. Other operators have found cracking on pipelines with characteristics similar to those in the FEI system and are moving towards using EMAT ILI tools to monitor cracking threats on pipelines for which suitable tools exist. To inform the development of the Project, FEI has been conducting a pilot project by running EMAT ILI tools on two of its CTS pipelines. The tool runs were successful and found instances of cracking that were not previously identified.

3.3.2 Industry Knowledge and Practice Regarding Cracking Threats

In order to stay current with evolving industry practices and to leverage industry experience, FEI is an active member of the pipeline community and participates in industry groups. This includes being an Integrity First Partner with the CEPA. Senior members of FEI's System Integrity department actively participate in formal CEPA Community of Practice groups, including Pipeline Integrity, Inline Inspection, Corrosion Control, and Geohazard Management. Participation in these groups includes conducting research, developing industry recommended practice and guidance documents such as the CEPA Recommended Practice for Managing Near-neutral pH Stress Corrosion Cracking, conducting benchmarking exercises, and sharing of integrity related experiences. A portion of each quarterly meeting is reserved for confidentially sharing information regarding recent failure incidents, company best practices, as well as

[10] CEPA Pipeline Integrity Working Group, "CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015.

integrity management challenges and successes. Through this process, FEI has developed an understanding of evolving industry practice regarding crack management.

The transmission pipeline industry works collaboratively to prevent pipeline failures as a failure on any pipeline affects the entire industry. Through the experiences of other gas transmission operators managing cracking on pipelines, FEI is aware that SCC (which could lead to failure) has been found on pipelines similar to those operated by FEI (i.e., with similar coatings, age, diameters, and operating stress level).

JANA observes the following regarding the increasing knowledge of cracking threats:[11]

> Historically, the majority of significant SCC has been associated with [polyethylene] tape. However, as companies have expanded monitoring, significant SCC has been found on asphalt-coated lines and on coal-tar coated pipe (previously considered to have a low susceptibility to SCC). This is consistent with the overall trend of SCC being found more and more in pipelines previously thought to be less susceptible, as the time dependent mechanisms at play continue to manifest themselves.

FEI is also aware that EMAT ILI is increasingly being adopted by industry for managing cracks and crack-like imperfections on transmission pipelines and enabling the mitigation of their potential for rupture. Gas transmission operators are having success with this approach to crack management and, as such, the use of EMAT crack detection ILI is rapidly becoming the industry standard for managing cracking threats on transmission pipelines. This adoption reflects the importance of crack detection due to the potential for significant consequences should a pipeline failure occur. A picture of a typical EMAT tool can be seen below in Figure 3-8.

Figure 3-8: Typical EMAT Tool[12]

[11] Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines,* at p. 5.

[12] *RODD EMAT Service: In-Line High Resolution Coating Disbondment Analysis.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rodd-emat/ROSEN-GROUP_RODD-EMAT-SERVICE/RoDD_EMAT_SF_E_201405.pdf

A summary of the feedback from other transmission pipeline operators regarding their recent experiences with EMAT is provided below:

- EMAT ILI has been run in pipelines with previously observed cracking, with diameters from NPS 10 to 42 and operating at a stress level greater than 30 percent SMYS. As technology becomes available, the operators plan to run EMAT ILI in smaller diameter pipelines.
- EMAT ILI has been successful in detecting crack-like features, although discriminating SCC within these crack-like features has been challenging. This uncertainty warrants conservative initial assessments followed by field verification digs in conjunction with laboratory material testing.
- The operators use a risk assessment (either qualitative, semi-quantitative, or quantitative) to prioritize EMAT ILI runs.
- Common challenges with successfully running EMAT ILI tools are:
  - Need for launching/receiving barrel modifications to accommodate EMAT ILI tools which are typically longer than other ILI technology tools;
  - Need for pipeline modifications such as removing heavy-wall sections and tight bends to minimize tool speed excursions;
  - Cleaning pipelines for optimal sensor performance so that crack-like features can be detected and sized to the best of tool capability; and
  - Controlling tool speed during the run in low-flow and/or customer-demand dependent pipelines.

Consistent with this evolving industry knowledge and practice, FEI advanced the TIMC Project to assess the threat of cracking on its larger diameter pipelines operating at transmission pressure, and assess the need to enhance its approach to managing cracking threats on these pipelines.

3.3.3 Pilot Project Demonstrates that EMAT ILI Detects Previously Unknown Instances of Potential Cracking

As part of FEI's project development work, FEI is completing a pilot of EMAT ILI evaluations on two CTS pipelines. This pilot is in progress, and as such, FEI is in the process of validating potential cracking detected by the EMAT tool. These instances of potential cracking on FEI's pipelines were not previously detected through opportunistic digs.

The two pipelines chosen for the pilot, CPH BUR 508 and LIV PAT 457, had instances of cracking that FEI discovered during integrity dig activities, unrelated to investigating cracking. FEI determined that these pipelines could be modified to run EMAT ILI tools on a timeline suitable for informing the TIMC CPCN Project.

This pilot demonstrates that instances of cracking that FEI was previously unaware of and which were not discovered through opportunistic integrity digs exist. While the results of the pilot are encouraging, as significant repairs or replacements have not been required to address these instances of cracking, the pilot also demonstrates that cracking exists on FEI's pipelines which FEI's existing practices are unable to detect.

The scope of work for this pilot, which also helped define the scope of the TIMC project activities, is being funded through the TIMC CPCN Development Costs deferral account and is described further in Section 5.3.3.

3.4 RISK ASSESSMENT CONFIRMS CREDIBILITY OF CRACKING THREATS TO CTS AND ITS, AND PINPOINTS CTS AS THE PRIORITY

3.4.1 Summary of Section

To assess the risk of cracking threats to FEI's transmission systems, FEI retained JANA to conduct two related assessments. The first was to assess the susceptibility of FEI's transmission system pipelines to cracking. The second was to conduct a baseline, system-level, safety QRA of FEI's transmissions systems that would quantify the safety risk posed by cracking threats in comparison to other threats and hazards.

JANA's reports are attached to this Application in Appendices B-1 and B-2:

- Appendix B-1 is JANA's report titled *Analysis of Cracking Threats in FEI Mainline*[13] *Transmission Pipelines*.
- Appendix B-2 is JANA's report titled *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines*.

Included in the appendices of the JANA reports are the C.V.s of the lead authors, Ken Oliphant, Ph.D., P.Eng. and James DuQuesnay, M.A.Sc.

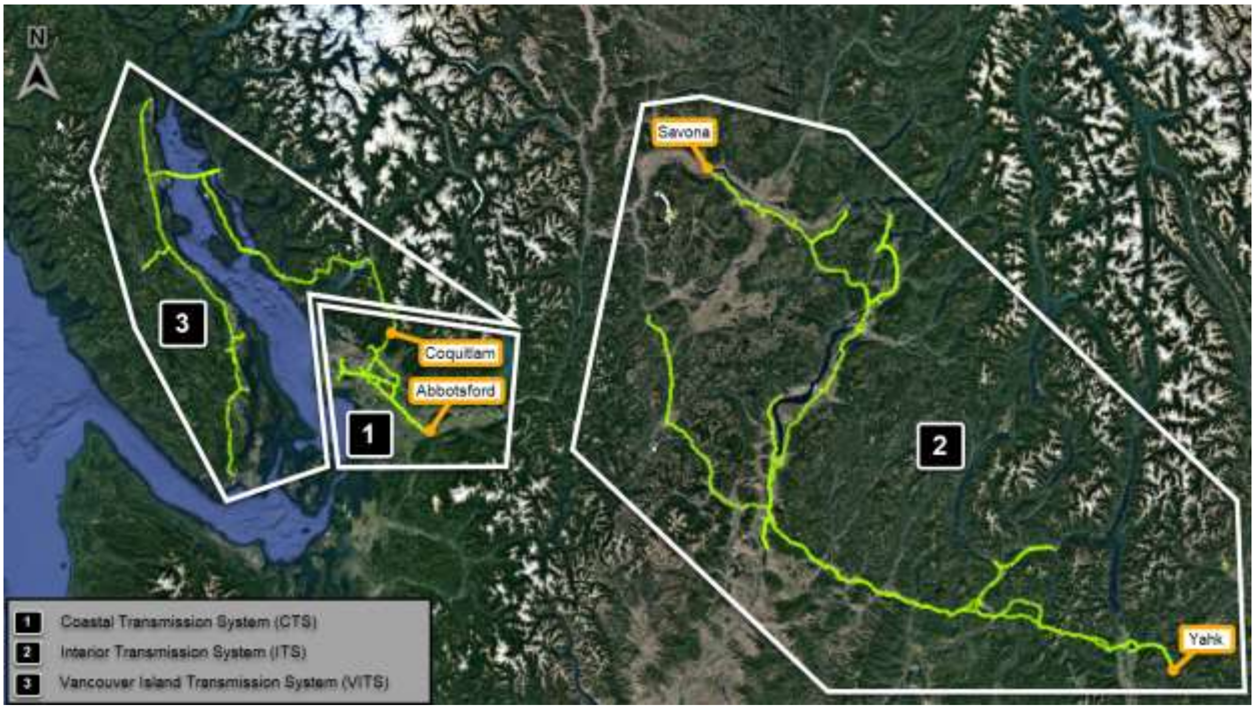
Based on its assessments, JANA concluded that the pipelines on FEI's CTS and ITS are susceptible to cracking threats which can lead to failure by rupture. The QRA identified that, at the system level, the safety risk is highest on the CTS and that cracking threats are the largest contributor to that risk. Based on the results of these assessments, FEI has prioritized work on the CTS in this Application and is developing a further TIMC project for work on the ITS.

[13] JANA has adopted the term "mainline" in Appendices B-1 and B-2 to describe pipelines within the scope of their studies. Mainline refers to FEI's transmission pipelines that are not laterals, and includes FEI's larger diameter pipelines that are in-line inspected.

3.4.2 FEI's Coastal, Interior and Vancouver Island Transmission Systems Were Assessed

The scope of JANA's investigation into the susceptibility of FEI's transmission pipelines to cracking threats encompassed the three transmission systems that FEI operates, as shown in Figure 3-9 below. These are FEI's larger diameter pipelines that operate at stress levels greater than 30 percent SMYS. These transmission systems are comprised of a network of natural gas pipelines that deliver gas to local distribution systems, which supply customers in the southern parts of the province and Vancouver Island.

Figure 3-9: FEI's Transmission Systems



An overview of each transmission system identified is provided below.

1. Coastal Transmission System (CTS)

   The CTS supplies gas to the Lower Mainland, Sunshine Coast and Vancouver Island. The CTS receives natural gas in Abbotsford and distributes it west. Construction of the CTS began in the 1950s and continues today.

2. Interior Transmission System (ITS)

   The ITS supplies gas to the Okanagan, Kootenays, and portions of the Thompson. Natural gas is received by the ITS at two points: (1) in Savona and distributed east, and (2) in Yahk and distributed west. Construction of the ITS began in the 1950s and continues today.

3. Vancouver Island Transmission System (VITS)

The VITS supplies gas to the Sunshine Coast and Vancouver Island. Natural gas from the CTS is initially compressed at Coquitlam and sent to the Sunshine Coast and Vancouver Island. The VITS contains several marine crossings. Construction of the VITS began in the 1990s and continues today.

As discussed below, JANA assessed the susceptibility of the transmission pipelines within these three systems to cracking.

3.4.3 CTS and ITS Are Susceptible to Cracking Threats

JANA's report, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, attached as Appendix B-1 to this Application, concludes that cracking poses a credible integrity hazard that needs to be addressed through active integrity management. JANA's assessment included:[14]

- A line-by-line assessment of susceptibility to cracking threats for the CTS, ITS, and VITS mainline transmission pipelines based on pipeline properties and operating conditions compared with those where historical failures have been observed in industry through analysis of PHMSA and Canada Energy Regulator databases and technical publications and discussions with FEI Subject Matter Experts (SMEs).
- An assessment of historical FEI dig reports and discussions with FEI SMEs to assess cracking found to date on FEI pipelines.
- An assessment of the potential for SCC cracks to grow to failure under the operating conditions of FEI's pipelines through analysis of industry historical failures and crack growth modelling in conjunction with Dr. Chen, University of Alberta.
- Estimates of the contribution of cracking threats to overall frequency of failure and risk based on the JANA baseline system level safety QRA (see JANA Project 18-1651 Quantitative Safety Risk Assessment).

JANA summarized the results of its assessment as follows (at pages 3-4 of Appendix B-1):

> Based on its assessment of the potential for cracking threats on FEI pipelines, JANA concluded that cracking threats (SCC and pipe seam) pose a credible integrity hazard that needs to be addressed through active integrity management. This is based on:
>
> - Identification of lines with characteristics that make them susceptible to cracking threats in the FEI system.
> - Identification of SCC and seam issues in FEI pipelines during integrity digs.

[14] Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, at p. 4.

- Analysis that indicates the identified SCC can grow to failure under FEI operating conditions as:
  - Industry failures have been observed within the operating stress range of the FEI susceptible lines.
  - Analysis of SCC crack growth rates based on FEI operating conditions in conjunction with Dr. Chen of the University of Alberta indicate the potential for cracks to grow to failure and, with practical assumptions, in timeframes on the order of five years under the most aggressive condition.
- The baseline system level safety Quantitative Risk Assessment ("QRA") conducted by JANA under a separate project identified cracking threats as one of the top threats to pipeline integrity[15]:
  - The QRA analyzed risk for all FEI's transmission pressure ("TP"), in-line inspected ("ILI"), mainline pipe in the Coastal Transmission System ("CTS"), Interior Transmission System ("ITS") and Vancouver Island Transmission System ("VITS") regions.
  - At the system level, the CTS was estimated to have the highest risk followed by the ITS and then the VITS.
  - For the CTS overall, cracking threats (SCC and pipe seam) were the top driver of risk. At the line level, of the 11 CTS lines identified as susceptible to cracking threats, cracking threats (SCC and pipe seam) are the top driver of risk for nine of the lines. For the other two lines cracking threats are the second and the fourth top line level threat (for each of these lines there are specific sections where cracking threats are the top risk driver).

The key aspects of the above conclusions are discussed below. The results of the QRA are discussed further in Section 3.4.4.

3.4.3.1 *CTS and ITS Pipelines Have the Same Properties as Pipelines Where Failures Have Been Observed by Other Operators*

JANA explains that it uses the term "susceptible" to indicate the potential for SCC or pipe seam cracking to initiate on the lines, based on the specific characteristics of the lines and their operating conditions. A "yes" susceptible line is one where the characteristics of the line are consistent with lines where SCC or pipe seam cracking has been observed on multiple systems within the broader pipeline industry. A "low" susceptible line is one with characteristics where no or very limited failures have historically been observed in the industry.

[15] Appendix B-2, JANA Corporation, *Quantitative Safety Risk Assessment.*

JANA applied susceptibility ratings to FEI's pipelines considering criteria such as coating type and manufacturing process that are typically found to be associated with the formation of SCC and seam weld cracking. Generally, pipelines constructed in 1990 or thereafter are considered to have low susceptibility to SCC based on age and coating types, whereas pipelines manufactured prior to 1970 are considered within the industry to be more susceptible to seam weld cracking.

JANA's high-level conclusion was as follows:

11 of the 13 CTS mainline transmission pipelines were identified as susceptible to cracking threats;

- 9 of the 12 ITS mainline transmission pipelines were identified as susceptible to cracking threats; and
- None of the 10 VITS mainline transmission pipelines were identified as susceptible to cracking threats.

JANA's susceptibility conclusions for the CTS, ITS and VITS are presented below in Table 3-3, Table 3-4, and Table 3-5, respectively.

Table 3-3: FEI CTS Pipelines: Susceptibility to Cracking Threats based on Installation Year and Coating Type

#	Pipeline Short Name	Pipeline Full Name	SCC Susceptibility[1]	Seam Weld Cracking Susceptibility[1]	Original Install Year(s)	Coating Types	Seam Type(s)
1[2]	HUN BAL 1066	Huntingdon – Balfour 42”	Yes	Low	1977	Coal Tar Enamel	Unknown
	BAL NIC 1066	Balfour – Roebuck 42”	Low	Low	1992, 2018	Fusion Bonded Epoxy	Unknown
2	HUN NIC 762	Huntingdon – Nichol 30”	Yes	Yes	1960, 1964	Coal Tar Enamel	DSAW
3	LIV COQ 323	Livingston – Coquitlam 12”	Yes	Yes	1957, 1958	Coal Tar Enamel	ERW
4	LIV PAT 457	Livingston – Pattullo 18”	Yes	Yes	1956	Coal Tar Enamel	Unknown
5	NIC PMA 610	Nichol – Port Mann 24”	Yes	Yes	1959	Coal Tar Enamel	SAW
6	CPH BUR 508	Cape Horn – Burrard 20”	Yes	Yes	1960, 1964	Coal Tar Enamel	DSAW, SAW
7	ROE TIL 914	Roebuck – Tilbury 36”	Yes	Low	1981	Coal Tar Enamel	DSAW
8	TIL BEN 323	Tilbury – Benson 12”	Yes	Yes	1959	Coal Tar Enamel	ERW
9	TIL FRA 508	Tilbury – Fraser 20”	Yes	Yes	1959	Coal Tar Enamel	ERW
10	NIC FRA 610	Nichol – Fraser 24”	Yes	Yes	1958, 1959, 1974	Coal Tar Enamel	Unknown
11	TIL LNG 323	Tilbury – LNG Plant 12”	Yes	Low	1970	Extruded PE, Shrink Sleeve on girth welds	ERW
12	NOO EMT 610	Noons Ck – Eagle Mtn 24”	Low	Low	1991	Fusion Bonded Epoxy	Unknown
13	PMA CPH 914	Port Mann – Cape Horn 36”	Low	Low	2000	Fusion Bonded Epoxy	Unknown

Notes:

[1] A susceptibility rating of “Yes” indicates that the cracking type has been found on pipelines with similar attributes in the industry. A rating of “Low” indicates that there are relatively limited or no cases of that cracking type found on pipelines with similar attributes in the industry.

[2] The Huntingdon – Balfour 42” was split into two sections due to distinct characteristics of the vintage versus newer sections of the pipeline.

1 **Table 3-4: FEI ITS Pipelines: Susceptibility to Cracking Threats based on Installation Year and Coating Type**

#	Pipeline Short Name	Pipeline Full Name	SCC Susceptibility[1]	Seam Weld Cracking Susceptibility[1]	Original Install Year(s)	Coating Types	Seam Type(s)
1	SAV VER 323	Savona – Vernon 12”	Yes	Yes	1957	Asphalt, Polymer Tape	Unknown
2	VER PEN 323	Vernon – Penticton 12”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
3	GRF TRA 273	Grand Forks – Trail 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
4	OLI GRF 273	Oliver Y – Grand Forks 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
5	PEN OLI 273	Penticton – Oliver Y 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
6	TRA CAS 219	Trail – Castlegar 8”	Yes	Yes	1957	Asphalt, Polymer Tape	Unknown
7	KIN PRI 323	Kingsvale – Princeton 12”	Yes	Low	1971	Extruded PE, Shrink Sleeve on girth welds	ERW
8	PRI OLI 323	Princeton – Oliver 12”	Yes	Low	1971	Extruded PE, Shrink Sleeve on girth welds	ERW
9	YAH TRA 323	Yahk – Trail (EKL) 12”	Yes	Low	1974, 1975	Extruded PE, Polymer Tape on girth welds	Unknown
10	OLI PEN 406	Oliver – Penticton 16”	Low	Low	1994	Extruded PE	ERW
11	DUK SAV 508	Duke Tap – Savona C/S 20”	Low	Low	1997	Extruded PE - Multilayer	ERW
12	YAH OLI 610	Yahk – Rossland 24”, Rossland – Oliver 24”	Low	Low	2000	Fusion Bonded Epoxy	SAW

2 <u>*Notes:*</u>

3 [1] *A susceptibility rating of “Yes” indicates that the cracking type has been found on pipelines with similar attributes in the industry. A rating of*
4 *“Low” indicates that there are relatively limited or no cases of that cracking type found on pipelines with similar attributes in the industry.*

5

1 **Table 3-5: FEI VITS Pipelines: Susceptibility to Cracking Threats based on Installation Year and Coating Type**

#	Pipeline Short Name	Pipeline Full Name	SCC Susceptibility[1]	Seam Weld Cracking Susceptibility[1]	Original Install Year(s)	Coating Types	Seam Type(s)
1	ISL MAN 273	Little R - Mid Island 10"	Low	Low	1990	Extruded PE, Extruded PE - Multilayer	Unknown
2	LRN LOP 273	Little River North 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
3	LRS LOP 273	Little River South 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
4	PRN LOP 273	Powell River North 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
5	PRS LOP 273	Powell River South 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
6	SCN LOP 273	Secret Cove North 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
7	SCS LOP 273	Secret Cove South 10"	Low	Low	1990	Fusion Bonded Epoxy	ERW
8	TEX MAN 273	Texada S - Texada N 10"	Low	Low	1990, 1991	Extruded PE	ERW
9	VAN MAN 273	Watershed-Secret Cove 10"	Low	Low	1990, 1991	Extruded PE	Unknown
10	VAN MAN 323	V1-Watershed 12"	Low	Low	1991	Extruded PE	ERW

2 *Notes:*

3 [1] *A susceptibility rating of "Yes" indicates that the cracking type has been found on pipelines with similar attributes in the industry. A rating of*
4 *"Low" indicates that there are relatively limited or no cases of that cracking type found on pipelines with similar attributes in the industry.*

3.4.3.2 *Evidence of Cracking on FEI's System*

As evidence in support of its conclusion regarding the susceptibility of FEI's transmission system to cracking threats, JANA also observes that cracking has been detected on FEI's pipelines. FEI is aware of the existence of these cracking threats through inspections of its pipelines during integrity dig activities. Examples of SCC and other crack-like imperfections found on FEI's pipelines are shown in Figure 3-10 and Figure 3-11, respectively.

Figure 3-10: Examples of Stress Corrosion Cracking as Identified on FEI's Transmission Pipelines

Figure 3-11: Example of a Lack of Fusion Weld Imperfection found on a FEI Transmission Pipeline

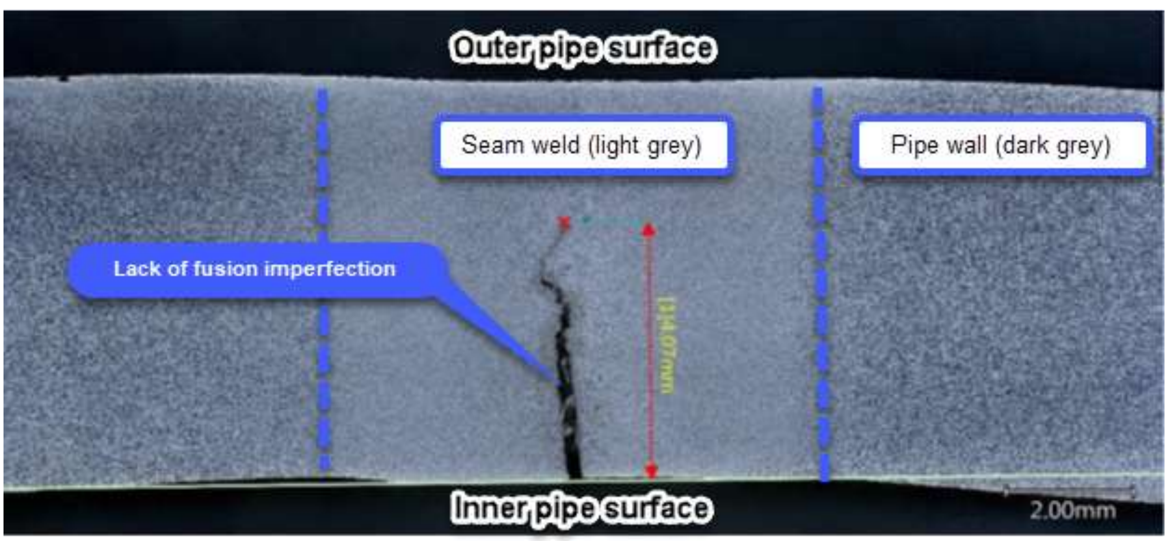


Table 3-6 and Table 3-7 below summarize cracking identified on several FEI CTS and ITS pipelines during select integrity digs, the results of which were reviewed by JANA. The results indicate that the conditions required for SCC crack initiation exist within FEI's CTS and ITS.

Table 3-6: FEI CTS Pipelines: Occurrences of Cracking on FEI pipe identified through JANA's review of selected integrity digs

#	Pipeline Short Name	Pipeline Full Name	SCC Susceptibility	Seam Weld Cracking Susceptibility	Integrity Digs with Cracking Threats
1	HUN BAL 1066	Huntingdon – Balfour 42"	Yes	Low	0
	BAL NIC 1066	Balfour – Roebuck 42"	Low	Low	0
2	HUN NIC 762	Huntingdon – Nichol 30"	Yes	Yes	0
3	LIV COQ 323	Livingston – Coquitlam 12"	Yes	Yes	2
4	LIV PAT 457	Livingston – Pattullo 18"	Yes	Yes	9
5	NIC PMA 610	Nichol – Port Mann 24"	Yes	Yes	0
6	CPH BUR 508	Cape Horn – Burrard 20"	Yes	Yes	15
7	ROE TIL 914	Roebuck – Tilbury 36"	Yes	Low	0
8	TIL BEN 323	Tilbury – Benson 12"	Yes	Yes	4
9	TIL FRA 508	Tilbury – Fraser 20"	Yes	Yes	1
10	NIC FRA 610	Nichol – Fraser 24"	Yes	Yes	2
11	TIL LNG 323	Tilbury – LNG Plant 12"	Yes	Low	0
12	NOO EMT 610	Noons Ck – Eagle Mtn 24"	Low	Low	0
13	PMA CPH 914	Port Mann – Cape Horn 36"	Low	Low	0

Table 3-7: FEI ITS Pipelines: Occurrences of Cracking on FEI pipe identified through JANA's review of selected integrity digs

#	Line Name	FEI Name	SCC Susceptibility	Seam Weld Cracking Susceptibility	Integrity Digs with Cracking Threats
1	SAV VER 323	Savona – Vernon 12"	Yes	Yes	33
2	VER PEN 323	Vernon – Penticton 12"	Yes	Yes	22
3	GRF TRA 273	Grand Forks – Trail 10"	Yes	Yes	86
4	OLI GRF 273	Oliver Y – Grand Forks 10"	Yes	Yes	55
5	PEN OLI 273	Penticton – Oliver Y 10"	Yes	Yes	7
6	TRA CAS 219	Trail – Castlegar 8"	Yes	Yes	21
7	KIN PRI 323	Kingsvale – Princeton 12"	Yes	Low	1
8	PRI OLI 323	Princeton – Oliver 12"	Yes	Low	4
9	YAH TRA 323	Yahk – Trail (ELK) 12"	Yes	Low	8
10	OLI PEN 406	Oliver – Penticton 16"	Low	Low	0
11	DUK SAV 508	Duke Tap – Savona C/S 20"	Low	Low	0
12	YAH OLI 610	Yahk – Rossland 24", Rossland – Oliver 24"	Low	Low	12

3.4.3.3 *SCC Cracks Have the Potential to Grow to Failure Under FEI Operating Conditions*

JANA's assessment is that SCC cracks can grow to failure under FEI operating conditions. In particular, JANA concludes:[16]

1. Industry failures have been observed within the operating pressure range of FEI's susceptible lines.
2. Analysis of SCC crack growth rates based on FEI operating conditions in conjunction with Dr. Chen of the University of Alberta indicates the potential for cracks to grow to failure and, with practical assumptions, in timeframes in the order of five years under the most aggressive conditions.

Each of these conclusions is discussed in turn below.

First, JANA observes that industry failures have occurred on pipelines at operating stresses across the range of the operating stresses of the FEI susceptible transmission pipelines (i.e., from 12 to 72 percent of SMYS). Specifically, JANA's review of Pipeline and Hazardous Materials Safety Administration (PHMSA) / Industry Incident Data indicates that:

- Approximately half of reported PHMSA SCC incidents through 2002-2016 occurred at 60 percent of SMYS or lower; and
- Approximately one quarter of reported incidents occurred at 55 percent of SMYS or lower, with some circumferential SCC leaks occurring below 30 percent of SMYS (in presence of additional loading factors).

Through information gathered during FEI's industry participation activities, FEI is also aware that its peer Canadian and American transmission pipeline operators have found, through their crack-detection ILI runs, potentially injurious SCC on pipelines operating below 50 percent of SMYS.

CEPA has also stated that "based upon the data collected by CEPA member companies it is apparent that there was no absolute threshold operating stress value for SCC initiation or propagation."[17] This is supported by CEPA's failure record where ruptures had occurred at operating stress levels between 49 and 71 percent of SMYS. There were no reported SCC ruptures in the PHMSA or CEPA failure records below 30 percent of SMYS.

[16] Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, p. 12.
[17] Bruce. "The Canadian Energy Pipeline Association Stress Corrosion Cracking Database," *International Pipeline Conference – Volume I, ASME 1998* (IPC1998-2067).

Second, analysis performed on SCC crack growth rates based on FEI operating conditions indicates the potential for SCC cracks to grow to failure within certain timeframes requiring active mitigation (e.g., in the order of five years under the most aggressive conditions).[18]

This analysis was conducted in conjunction with Dr. Chen of the University of Alberta, a recognized SCC expert researcher. Software developed by Dr. Chen, called *Pipe-Online*, was used for the analysis of SCC crack growth behaviour and to predict the remaining lifespan of a pipeline prior to cracks growing to failure. The analysis utilized pressure data from 54 pipeline locations in the CTS and ITS, 8 FEI detailed field inspection reports from integrity digs, and a summary of SCC findings from 14 dig excavations. The analysis considered a range of crack depths and lengths, which are reasonable approximations of what could be anticipated to be present in the FEI system. The analysis also considered a range of fracture toughness[19] values consistent with typical industry values. The analysis used these inputs, FEI's operating conditions, and the *Pipe-Online* software to project the time to failure of SCC cracks.

The analysis estimated a range of potential time until failure from 5 to 85 years, indicating that there is the potential for SCC cracks to grow to failure under the operating conditions of the FEI system. While the lower bound timeframe of five years is considered highly unlikely (reflecting a combination of the longest, deepest crack with the lowest toughness pipeline), the analysis does indicate that SCC is a credible integrity threat that needs to be managed in a timely manner.

3.4.4 QRA Identifies Cracking as Highest Safety Risk to the CTS

As described above, to estimate the relative safety risk level of cracking threats to FEI's transmission pipelines and inform the priority and urgency of its TIMC projects, FEI contracted JANA to conduct a baseline, system-level, safety QRA. The results are presented in JANA's report, *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines*, attached as Appendix B-2 to this Application.

The QRA assessed over 20 safety risks to the 13 CTS, 12 ITS and 10 VITS pipelines listed in Tables 3-3, 3-4 and 3-5 above. JANA summarized the results as follows:

> At the system level, the CTS was estimated to have the highest risk followed by the ITS and then the VITS. For the CTS overall, cracking threats (Stress Corrosion Cracking (SCC) and pipe seam) were the top driver of risk. At the line level, of the 11 CTS lines identified as susceptible to cracking threats, cracking threats (SCC and pipe seam) are the top driver of risk for nine of the lines. For the other two lines cracking threats are the second and the fourth top line level threat (for each of these lines there are specific sections where cracking threats are the top risk driver).

[18] This analysis by Dr. Chen is included within Appendix B-1: Report: JANA Project 18-1651:P *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*. SCC crack growth analysis was applied to SCC crack features derived from a sample of FEI dig reports, actual FEI operating data and pipe material properties characteristic of the FEI system.

[19] Fracture toughness is a measure of the resistance of a material to static or dynamic crack extension, used in the calculation of critical flaw size for crack-like defects.

The sections below provide more information regarding the QRA undertaken by JANA and the risk level and associated risk drivers for the CTS.

3.4.4.1 *A QRA Systematically and Quantitatively Estimates the Probability and Consequences of Hazardous Events*

A QRA is a formal and systematic approach to estimating the probability and consequences of hazardous events, and expresses the results quantitatively as risk to people, the environment, and/or the business.

QRAs can be performed at the system level (general) or the integrity management level (specific). The purpose of a system-level QRA is to assess the overall threats to the pipeline system at a level that enables identification of general system risk and the threats driving that risk, to identify where additional integrity management activities may be warranted. Where significant risk is identified, mitigation approaches can be identified and evaluated to reduce the level of risk. By design, a system-level QRA uses available information to derive the best possible forecast of system risk, typically employing models based on historical industry failure rates or higher-level models.

Where more detailed risk management is required, an integrity management-level QRA can be performed. For example, whereas a system-level QRA can identify pipelines where mitigation may be deemed necessary, an integrity management-level QRA is needed to identify the specific locations on the pipelines where the mitigation is required (i.e., where to dig and repair). An integrity management-level QRA requires specific input data, such as the output of ILI tools, to identify the specific location and size of the flaws.

QRAs are an accepted method for transmission operators to comply with the CSA Z662 standard, which requires operators to develop, implement, and continually improve a risk management process for their pipeline systems that identifies, assesses, and manages the hazards and associated risks over their life cycle.

3.4.4.2 *System-level QRA indicates CTS is at greatest risk at the System Level, and Cracking is the Greatest Contributor to that Risk*

In a baseline system-level QRA, the safety risk associated with a pipeline is calculated by the following equation:

$$Safety\ Risk = Likelihood\ of\ a\ Failure\ * Safety\ Consequence\ of\ a\ Failure$$

The likelihood of a failure is based on the type of threat[20] and the safety consequence of a failure is based on the size of a gas release and the potential for the gas to ignite.

[20] JANA's models consider over 20 threats, including external corrosion, internal corrosion, stress corrosion cracking, excavation damage, manufacturing defects, construction defects, and earth movements.

The baseline system-level QRA, provided in Appendix B-2, includes risk estimates for the CTS, ITS and VITS. The degree of contribution of each threat to overall safety risk was also identified and indicates that cracking threats are quantifiable at levels approaching or exceeding other threats managed through FEI's IMP-P.

Figure 2 from JANA's report, reproduced below in Figure 3-12, summarizes the total risk for each of the three pipeline systems on an overall and per kilometer basis. As noted by JANA, the CTS has the highest risk, driven primarily by its proximity to populated areas, followed by the ITS system. The VITS system has the lowest risk as it is a newer system in largely unpopulated areas.[21]

Figure 3-12: Safety Risk Comparison between CTS, ITS, and VITS. Showing: (a) total safety risk and (b) average safety risk per km of pipeline.

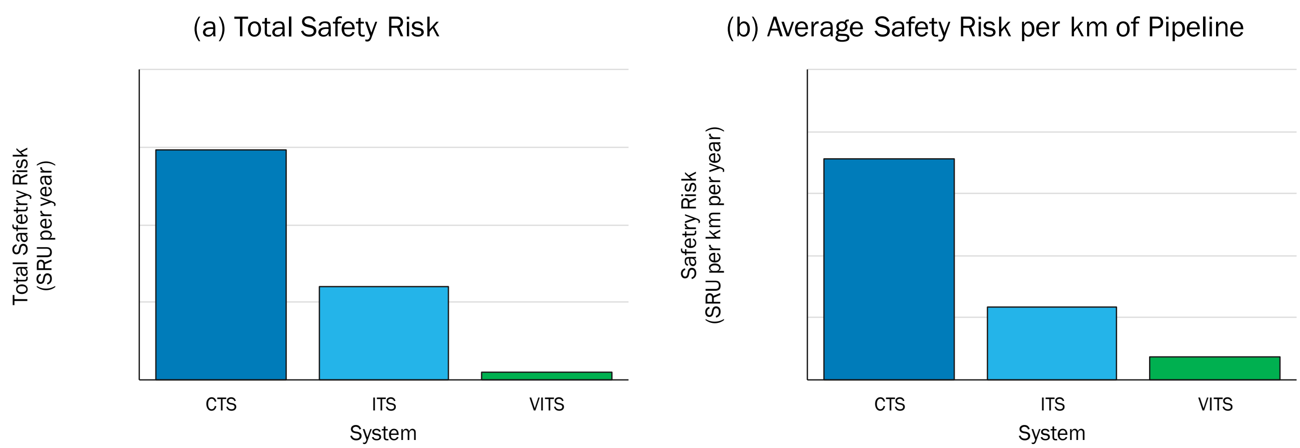


Figure 3 from JANA's report, as reproduced below in Figure 3-13, provides a high-level summary of how the different threats contribute to overall safety risk for the CTS. As stated by JANA: "At the system level cracking threats (SCC and pipe seam) are the top driver of risk for the CTS."[22]

[21] Appendix B-2, JANA Corporation, *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines,* pp. 14-15.

[22] Appendix B-2, JANA Corporation, *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines,* p. 15.

Figure 3-13: Threat Contribution to Safety Risk for CTS Pipelines

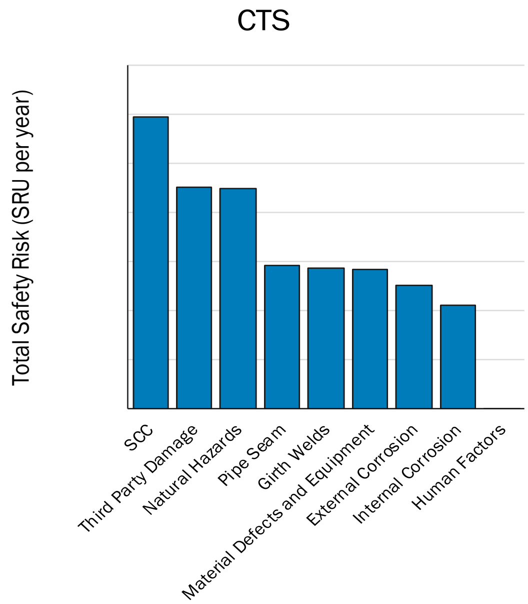


Table 5 from JANA's report, as reproduced below in Table 3-8, provides a breakdown of the pipeline and threat safety risk rank for the CTS pipelines. The table lists the lines in order of risk ranking (highest to lowest total line risk). For each line the top four threats driving risk are ranked. For 9 of the 11 lines identified as being susceptible to cracking threats, SCC and/or pipe seam cracking are the highest driver of risk. For the other two lines, cracking threats are the second and the fourth highest threat, respectively. For these two lines, there are specific sections where cracking threats are the top driver of risk.[23]

Table 3-8: Safety Risk per Pipeline per Threat for CTS Pipelines

Rank	Line Name	Cracking Susceptibility*	Threat Risk Rank
1	HUN NIC 762	Yes	1. **SCC**
			2. Natural Hazards
			3. Third Party Damage
			4. **Pipe Seam**
2	NIC FRA 610	Yes	1. **SCC**
			2. Natural Hazards
			3. Third Party Damage
			4. **Pipe Seam**

[23] Appendix B-2, JANA Corporation, *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines*, pp. 16-17.

Rank	Line Name	Cracking Susceptibility*	Threat Risk Rank
3	HUN NIC 1066	Yes	1. **SCC** 2. Natural Hazards 3. Third Party Damage 4. Girth Welds
4	CPH BUR 508	Yes	1. **SCC** 2. Third Party Damage 3. Natural Hazards 4. External Corrosion
5	LIV PAT 457	Yes	1. **SCC** 2. Third Party Damage 3. Natural Hazards 4. Girth Welds
6	ROE TIL 914	Yes	1. **SCC** 2. Natural Hazards 3. Third Party Damage 4. Girth Welds
7	NIC PMA 610	Yes	1. **SCC** 2. Natural Hazards 3. Third Party Damage 4. Girth Welds
8	LIV COQ 323	Yes	1. Third Party Damage 2. **SCC** 3. Natural Hazards 4. Girth Welds
9	TIL FRA 508	Yes	1. **SCC** 2. Third Party Damage 3. Natural Hazards 4. Girth Welds
10	NOO EMT 610	Low	1. Natural Hazards 2. Third Party Damage 3. Girth Welds 4. Material Defects and Equipment

Rank	Line Name	Cracking Susceptibility*	Threat Risk Rank
11	TIL LNG 323	Yes	1. Third Party Damage
			2. Natural Hazards
			3. Girth Welds
			4. **SCC**
12	TIL BEN 323	Yes	1. **SCC**
			2. Third Party Damage
			3. Natural Hazards
			4. Girth Welds
13	PMA CPH 914	Low	1. Third Party Damage
			2. Natural Hazards
			3. Girth Welds
			4. Material Defects and Equipment

* *"Yes" for susceptibility indicates that cracking has been found on pipelines with similar attributes in the industry. "Low" for susceptibility indicates that there are relatively limited, or no cases of cracking found on pipelines with similar attributes in the industry.*

FEI interprets the estimated risk levels from the baseline QRA as indicative that cracking threats are significant to the ongoing safe operation of its CTS pipelines. In addition to cracking, other highly-ranked threats identified by the baseline QRA include third-party damage and natural hazards. FEI's system-level programs for managing third-party damage and natural hazards, such as right-of-way clearing, BC 1 Call participation, and regional seismic assessments, are well established and align with current industry practices.

3.4.5 Risk Assessment Supports Prioritizing Work on CTS

Based on the assessments described above, several CTS and ITS transmission pipelines have been identified as susceptible to cracking and, in some cases, evidence of cracking has already been found on these pipelines. When compared as a calculated safety risk, the baseline QRA estimates that the CTS pipelines present a higher risk at the system level when compared to the ITS pipelines, and that cracking threats are the top driver of that risk.

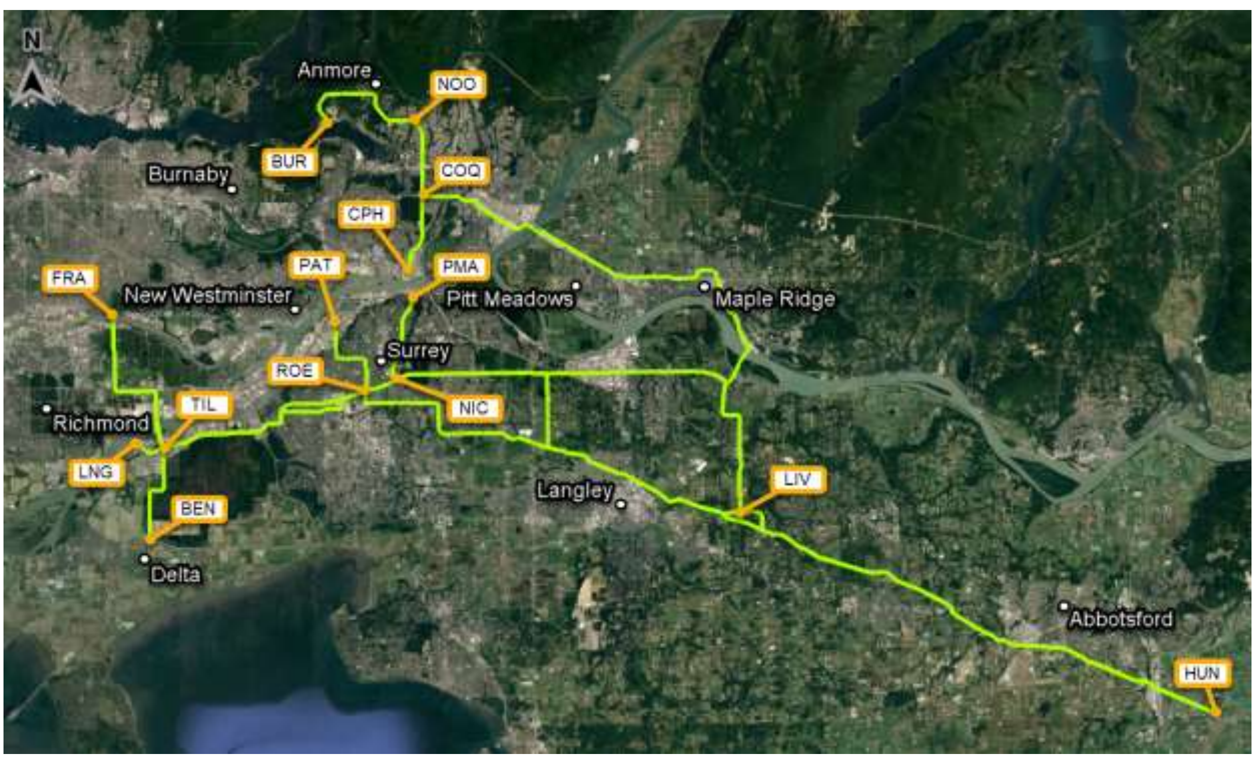
To date, informed by the QRA conclusions, FEI's TIMC project planning has identified the need for two CPCN applications in order to address cracking threats. The delineation for the two CPCN applications is based on risk, and results in a regional split: this Application for the CTS, followed by a subsequent application for the ITS. Dividing the applications at the system level, while prioritizing work on the CTS based on its heightened risk profile, enables FEI to advance its risk mitigation efforts in a timely and pragmatic manner. FEI is committed to timely action to achieve the integrity management capabilities described within this Application, and its prioritization of the CTS TIMC Application supports this objective.

The CTS pipelines that are the subject of the CTS TIMC Application are listed in Table 3-9, and maps of these CTS pipelines are shown in Figure 3-14 below.

Table 3-9: Transmission Pipelines Addressed by the CTS TIMC Project

#	CTS Line Name	FEI Name	Approximate Length
1	HUN NIC 1066	Huntingdon – Nichol 42”	55 km
2	HUN NIC 762	Huntingdon – Nichol 30”	56 km
3	LIV COQ 323	Livingston – Coquitlam 12”	35 km
4	LIV PAT 457	Livingston – Pattullo 18”	30 km
5	NIC PMA 610	Nichol – Port Mann 24”	5 km
6	CPH NOO 508 NOO BUR 508	Cape Horn – Burrard 20”	17 km
7	ROE TIL 914	Roebuck – Tilbury 36”	13 km
8	TIL BEN 323	Tilbury – Benson 12”	6 km
9	TIL FRA 508	Tilbury – Fraser 20”	10 km
10	NIC FRA 610	Nichol – Fraser 24”	24 km
11	TIL LNG 323	Tilbury – LNG Plant 12”	2 km
Total Length of CTS TIMC Pipelines			**254 km**

Figure 3-14: 11 CTS Pipelines Requiring System-Level Cracking Mitigation



3.5 *FEI MUST ENHANCE ITS INTEGRITY MANAGEMENT CAPABILITIES TO MITIGATE THE RISK DUE TO CRACKING ON THE CTS*

3.5.1 Summary of Section

Based on the changes in industry practice described in Section 3.3 and the risk assessment in Section 3.4, FEI's obligations to ensure safe and reliable operation of its assets dictate that FEI must enhance its integrity management capabilities to manage cracking threats on the CTS. The potential consequences of not doing so are significant and unacceptable to FEI.

3.5.2 FEI's Statutory and Regulatory Obligations to Mitigate Cracking Threats

FEI's statutory and regulatory obligations align with FEI's efforts to take additional measures to mitigate the risk of failure on the 11 CTS pipelines due to cracking threats.

The integrity-related regulatory provisions applicable to FEI's gas system assets, as expressed by standards such as CSA Z662, are typically goal-oriented rather than prescriptive in nature. As such, the requirements are expressed as outcomes to be achieved, rather than as descriptions of how to achieve those outcomes. The specific actions that FEI must take to eliminate or mitigate cracking threats are therefore not specifically defined in the applicable laws, regulations, or standards. For example, a key outcome-based requirement for pipeline operators in British Columbia is Section 37 (1) (a) of the OGAA, which requires British Columbia Oil and Gas Commission (BCOGC) permit holders to "prevent spillage"[24] associated with the operation of pipelines operating at or above 700 kPa.

Of particular relevance is FEI's obligation to comply with the CSA Z662 standard, which is prescribed by the *Pipeline Regulation* under the OGAA. An operative section of CSA Z662 is section 10.3.1, which states:

> 10.3.1 The pipeline system integrity management program required by Clause 3.3 shall include procedures to monitor for conditions that can lead to failures, to eliminate or mitigate such conditions, and to manage integrity data. Such integrity management programs shall include a description of the operating company commitment and responsibilities, quantifiable objectives, and methods for
>
> a) assessing risks;
>
> b) identifying risk reduction approaches and corrective actions;
>
> c) implementing the integrity management program; and
>
> d) monitoring results.

[24] "Spillage" as defined in the OGAA, means "petroleum, natural gas, oil, solids or other substances escaping, leaking or spilling from (a) a pipeline, well, shot hole, flow line, or facility, or (b) any source apparently associated with any of those substances."

As FEI has identified cracking threats as a condition that can lead to failure on the CTS, and there are known approaches that can eliminate or mitigate these conditions, FEI believes it must enhance the ability of its IMP-P to locate, assess and address cracking threats on these pipelines.

The BCOGC has provided written support for the TIMC Project, recognizing that the Project is in alignment with FEI's regulatory and legal responsibilities as a BCOGC permit holder. The letter from the BCOGC to FEI, dated November 16, 2020, is attached as Appendix C to the Application.

The BCUC has recently recognized FEI's obligations to ensure the safety and security of its pipeline operations. In the case of FEI's Application for a CPCN for the Inland Gas Upgrade (IGU) Project, the BCUC noted in its Decision[25] (at p. 7) that "the primary justification for the IGU Project relates to safety, specifically, safety of supply and the continued provision of natural gas without interruption to customers, as well as the physical safety of residents and others along and near the laterals." The BCUC went on to state (at p. 7): "In the Panel's view, FEI has a duty to ensure the safety and security of individuals who may be injured due to an explosion emanating from a pipeline rupture and subsequent ignition."

The need for the CTS TIMC Project similarly relates to safety, and FEI's duty to ensure the continued safe operation of the CTS pipelines. As discussed in Section 3.4, FEI has assessed the safety risk of cracking threats and confirmed that they are a credible threat to the CTS, and the greatest contributor to its overall safety risk potential. As discussed below, the potential consequences of not mitigating this risk are significant. As such, in order to properly mitigate this cracking risk, FEI must enhance its integrity management practices in ways that are consistent with industry technologies and practices.

3.5.3 Failure Due to Cracking Could Have Unacceptable Consequences

As set out in section 3.4, FEI has demonstrated that cracking is a credible threat to the CTS that has the potential to cause failure by rupture. While such failures are low probability events, the potential consequences are significant and are unacceptable to FEI. This section discusses these potential consequences.

3.5.3.1 *Transmission Pipelines Operating at or Above 30 Percent of SMYS Can Rupture*

The consequences of pipeline failure depend in large part on whether it will fail by rupture or by leaking. As discussed below, the 11 CTS pipelines can all fail by rupture, which increases the potential safety consequences.

A pipeline's potential to fail by rupture due to time-dependent threats can be determined by comparing the pipeline's operating hoop stress to the SMYS of the pipe. For ease of reference:

[25] BCUC Decision and Order G-12-20, dated January 21, 2020. Online: https://www.bcuc.com/Documents/Proceedings/2020/DOC_56891_2020-01-21-G-12-20-FEI-CPCN-IGU-Project-Decision.pdf.

- 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 gas in the piping.
- The yield strength of a pipe is the level of stress where the pipe begins to permanently deform or 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 CSA Z662 as the delineation between a transmission pipeline and a gas distribution system.[26] It is generally accepted by FEI and the Canadian pipeline industry that a pipeline operating at or above 30 percent of SMYS has a potential to fail by rupture, whereas a pipeline operating below 30 percent of 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" by Andrew Cosham and Phil Hopkins,[27] which indicates that full scale tests on part-wall and through-wall defects showed that it is very unlikely that a part-wall defect will fail as a rupture at a stress level less than 30 percent.

Pipeline leaks are accepted by the Canadian natural gas delivery industry as generally having a lower potential for significant consequences than ruptures. This acceptance is demonstrated by CSA Z662-19 Clause O.2.2.3.1, which states that human and environmental safety consequences of a small leak in a non-sour natural gas[28] pipeline are insignificant. The same is not true for failure by rupture.

3.5.3.2 *The Consequences of a Rupture can be Significant*

FEI is committed to adopting integrity management solutions to prevent ruptures on its systems, as it is recognized that ruptures can have significant and unacceptable consequences, such as:

- **Safety Consequences:** If the gas ignites, there can be significant safety impacts beyond the immediate area surrounding the pipeline. An ignited release can result in potential harm due to ensuring fire and resulting thermal effects on people and property.
- **Reliability Consequences:** A pipeline rupture, in the absence of a redundant gas

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

[27] Andrew Cosham and Phil Hopkins, "A Review of the Time Dependent Behaviour of Line Pipe Steel", online: http://proceedings.asmedigitalcollection.asme.org/proceeding.aspx?articleid=1646086.

[28] Non-sour natural gas is gas that does not contain material amounts of hydrogen sulphide, a substance that can significantly increase the potential safety consequences of a leak. FEI transports and delivers non-sour natural gas.

supply source, would result in loss of supply to end-use customers with economic consequences for residential, commercial, and industrial customers.

- **Environmental Consequences:** A pipeline rupture could result in damage to the natural environment, potentially impacting aquatic and terrestrial resources, in addition to degraded air quality and greenhouse gas emissions. The environmental consequences associated with a pipeline 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 BCOGC. In addition, the release of gas by rupture would be considered a reportable incident under the *Environmental Management Act Spill Reporting Regulation* for transmission pipelines.
- **Regulatory Consequences:** In alignment with the Canadian transmission pipeline industry, FEI and the BCOGC consider that a failure by rupture of FEI's natural gas pipelines to be a significant incident and not acceptable performance within its IMP-P.

This Project is driven by the safety consequences of a rupture.

To illustrate the potential consequences of a natural gas pipeline rupture, the following are examples experienced by North American natural gas transmission pipeline operators. The incidents described below that occurred in the United States are included due to their influence on gas transmission pipeline operator practice and the regulatory environment in both the United States and Canada. With respect to safety consequences, the diameter and operating pressure of a given pipeline correlate to the size of the potential affected area in the event of an ignited rupture failure event. This means that a smaller diameter pipeline will impact a smaller area than a larger diameter pipeline.

- On October 9, 2018, the Enbridge (Westcoast) NPS 36 natural gas transmission pipeline experienced an ignited rupture. As identified in the Transportation Safety Board of Canada's investigation report,[29] the rupture originated at stress corrosion cracks on the outside surface of the pipe. The Enbridge media statements state:[30] "The BC Pipeline comprises of two pipelines, a 36-inch and a 30-inch, that run parallel to each other. Both pipelines were shut down following the rupture on the 36-inch line." While one of the two pipelines (i.e., the NPS 30 line) became operational on October 11, 2018, pipeline capacity remained constrained without the larger NPS 36 line in-service, resulting in reduced gas supplies and a loss of service for some FEI customers. A more widespread and impactful loss of service to Lower Mainland and Vancouver Island customers, including a system shutdown, could have occurred had this event taken place during a period with colder temperatures.

---

[29] Transportation Safety Board of Canada. "Pipeline Transportation Safety Investigation P18H0088." Online: https://www.tsb.gc.ca/eng/rapports-reports/pipeline/2018/p18h0088/p18h0088.html.

[30] Enbridge. "Enbridge Responds to Natural Gas Transmission Pipeline Incident North of Prince George." Online: https://www.enbridge.com/media-center/media-statements/prince-george-pipeline-incident (dated October 10, 2018, 3:48 p.m. PST).

- On January 25, 2014, the TransCanada PipeLines Limited NPS 30 natural gas transmission pipeline experienced an ignited rupture in an agricultural area. The cause pertained to a construction-related imperfection in a weld (constructed in 1960) that remained stable until being subject to increasing stresses during operation. Possible factors included weakened soil support around the pipeline during past excavation activity, frost effects, and pipe thermal contraction due to a prior absence of gas flow in the line. The rupture impacted nearly 4000 residents during a cold winter month with local temperatures as low as approximately minus 20 degrees Celsius. The Transportation Safety Board of Canada's website states:[31]

> "A crater measuring approximately 24 metres long by 12.5 metres wide was created, and debris was ejected approximately 100 metres from the rupture site. Natural gas burned for approximately 12 hours. Five residences in the immediate vicinity were evacuated, and Provincial Highway 303 was closed until the fire was extinguished. There were no injuries."
>
> …
>
> "As a precaution, two adjacent pipelines, lines 400-2 and 400-3, were shut down, assessed, and returned to service on 26 January 2015. This resulted in the loss of natural gas service to 9 rural communities in Manitoba for approximately 80 hours."

- On September 9, 2010, the Pacific Gas and Electric Company, NPS 30 natural gas transmission pipeline experienced an ignited rupture in a residential area in San Bruno, California. The probable cause was identified as "inadequate quality assurance and quality control in 1956 during its Line 132 relocation project" and an "inadequate pipeline integrity management program, which failed to detect and repair or remove the defective pipe section". The National Transportation Safety Board website states:[32]

> "The rupture produced a crater about 72 feet long by 26 feet wide. The section of pipe that ruptured, which was about 28 feet long and weighed about 3,000 pounds, was found 100 feet south of the crater. PG&E estimated that 47.6 million standard cubic feet of natural gas was released. The released natural gas ignited, resulting in a fire that destroyed 38 homes and damaged 70. Eight people were killed, many were injured, and many more were evacuated from the area."

- On August 19, 2000, the El Paso Natural Gas Company, NPS 30 natural gas transmission pipeline experienced an ignited rupture that occurred adjacent to a river crossing. The probable cause was identified as internal corrosion. The National

---

[31] Transportation Safety Board of Canada. "Pipeline Transportation Safety Investigation P14H0011." Online: http://bst-tsb.gc.ca/eng/rapports-reports/pipeline/2014/p14h0011/p14h0011.asp.

[32] National Transportation Safety Board. "Pacific Gas and Electric Company Natural Gas Transmission Rupture and Fire." Online: https://www.ntsb.gov/investigations/accidentreports/pages/PAR1101.aspx.

Transportation Safety Board website states:[33]

> "The released gas ignited and burned for 55 minutes. Twelve persons who were camping under a concrete-decked steel bridge that supported the pipeline across the river were killed and their three vehicles destroyed. Two nearby steel suspension bridges for gas pipelines crossing the river were extensively damaged."

- On August 7, 2000, the Westcoast Energy Inc. NPS 30 natural gas transmission pipeline, near the Zopkias Rest Stop at Exit 217 Coquihalla Highway, British Columbia, ruptured. The National Transportation Safety Board of Canada website states:[34]

> "…a rupture occurred at a localized hard spot on the Westcoast Energy Inc. 762-millimetre outside diameter T-South Mainline at Mile Post 569.9 near the Zopkios rest stop at Exit 217, Coquihalla Highway, British Columbia. Several vehicles at the rest stop were damaged as a result of thrown debris from the explosion. There were no injuries. The Coquihalla Highway was closed to traffic for 3 ½ hours following the rupture."

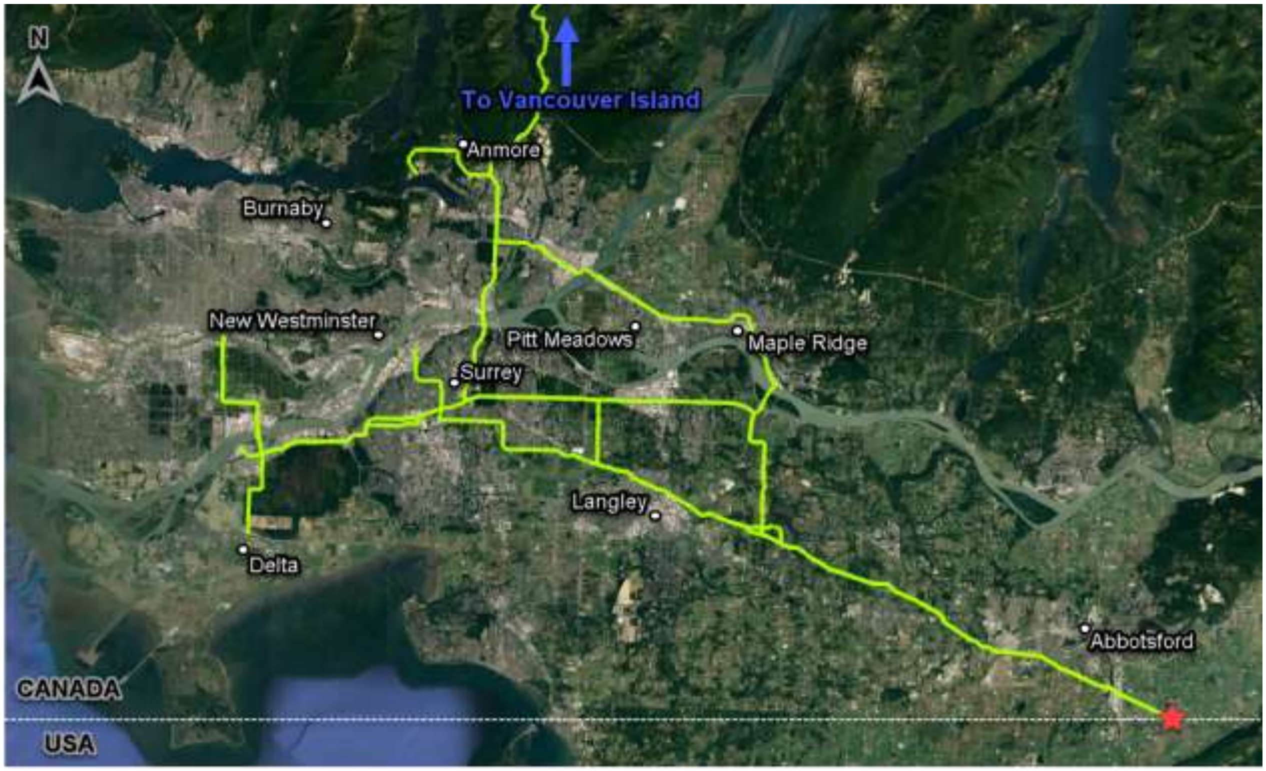
3.5.3.3 *Large parts of FEI's CTS are Located in Highly Urban Areas*

As shown in Figure 3-15 below, the CTS begins in Abbotsford (identified by the red star) and delivers gas west through a n integrated network of transmission pressure pipelines. Much of the CTS is located in residential, commercial and industrial areas of the Lower Mainland.

[33] National Transportation Safety Board. "Natural Gas Pipeline Rupture and Fire." Online: https://www.ntsb.gov/investigations/accidentreports/pages/PAR0301.aspx.

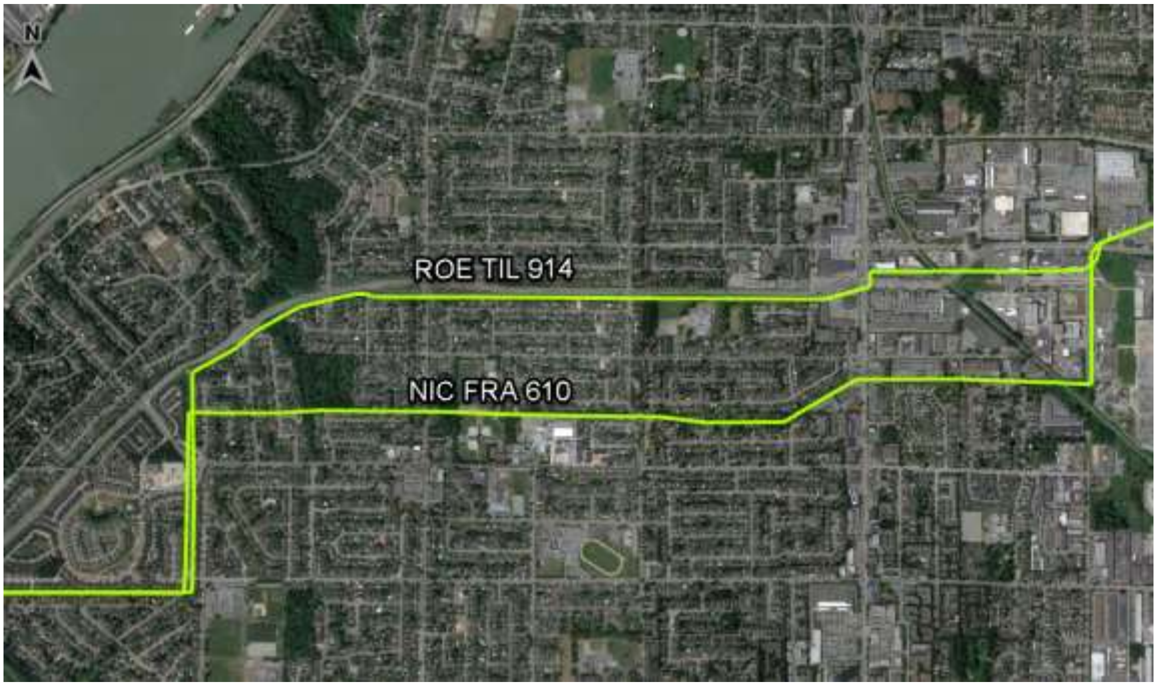
[34] Transportation Safety Board of Canada. "Pipeline Investigation Report P00H0037." Online: http://www.bst-tsb.gc.ca/eng/rapports-reports/pipeline/2000/p00h0037/p00h0037.asp.

Figure 3-15: Overview of FEI's CTS



An example of two FEI CTS statutory rights-of-way (SRW) located in Delta, BC is shown in Figure 3-16 below. The pipelines run through dense residential areas in close proximity to the dwellings and in some locations, coexist within the same SRW. Due to much of the CTS being located in highly urban areas, the potential consequences of a failure are significant and necessitate enhancements to FEI's integrity management practices, as described above.

Figure 3-16: Example of FEI CTS Statutory Rights-of Way



3.6 *CONCLUSION*

FEI has a robust IMP-P with which it successfully operates and manages its transmission pipelines. Continual improvement is an expected and necessary component of an IMP-P, as the inputs to a company's integrity management decisions, and the decisions themselves, will evolve as industry knowledge, technology and expectations change. FEI's transmission pipelines will therefore require investment over their lifecycle to ensure their ongoing safety, reliability, and environmentally responsible performance.

At this time, FEI's continual improvement activities have identified the need to enhance its capabilities for mitigating cracking threats on 11 of its CTS pipelines. Cracking threats have resulted in rupture failure of transmission pipelines, and FEI's risk assessment has confirmed that cracking is a credible threat to these CTS pipelines and is the greatest contributor to safety risk on the CTS. FEI is committed to adopting proactive integrity management solutions to prevent such failures on its system. FEI's planned TIMC Projects will implement the most cost-effective solutions to evolve FEI's time-dependent cracking threat management and risk management capabilities, resulting in improved overall integrity management capabilities for FEI's transmission pipelines.

To respond to FEI's evolving understanding of the cracking threat to identified pipelines in its transmission system and to align with evolving industry best practices that are utilizing tools with new and improved capabilities and functionalities to assess, manage and mitigate cracking, FEI must evaluate the feasibility, appropriateness, and cost-effectiveness of improved alternatives to its status quo. Section 4 evaluates alternatives for meeting this need.

4. DESCRIPTION AND EVALUATION OF ALTERNATIVES

4.1 *INTRODUCTION AND OVERVIEW*

This section describes FEI's evaluation of alternatives to complete the CTS TIMC Project. Based on the Project need and justification set out in Section 3, the objective of the Project is to enhance FEI's integrity management capabilities to mitigate cracking threats to the 11 CTS transmission pipelines (Project Objective).

There are six alternatives currently available to achieve the Project Objective which FEI evaluated using non-financial and financial criteria. A summary of the alternatives evaluation is provided in Table 4-1 below.

Table 4-1: Summary of Alternatives Evaluation

	Non-Financial Assessment	Technical Feasibility	Financial Assessment	Financial Feasibility
Alternative 1: SCCDA		Not Feasible		
Alternative 2: PRS		Not Feasible		
Alternative 3: HSTP		Not Feasible		
Alternative 4: EMAT ILI		**Feasible**		**Feasible**
Alternative 5: PLR		Potentially Feasible		Not Feasible
Alternative 6: PLE		Potentially Feasible		Not Feasible

Based on an assessment using the non-financial criteria, three alternatives were screened out as not technically feasible because they were unable to be implemented on the overall CTS in such a way as to sufficiently mitigate cracking threats. Based on a financial assessment, two of the remaining three alternatives were screened out because they were not financially feasible due to high-level cost estimates approaching $2 billion, approximately six times the costs of the EMAT ILI alternative. EMAT ILI is the sole option which is both technically and financially feasible and is therefore the preferred alternative for the CTS TIMC Project.

An exception to the above conclusion regarding EMAT ILI being the preferred alternative is for the Noon's Creek to Burrard 508 segment of the Cape Horn to Burrard 508 transmission pipeline, which does not have the gas flow conditions required to move an ILI tool through the pipeline.[35] As such, FEI selected the pressure regulating station (PRS) alternative to manage and mitigate cracking threats on this segment.

The remainder of Section 4 provides details of the alternatives analysis as follows:

[35] As described in section 4.7, since the decommissioning of BC Hydro's Burrard Thermal Generating Station in 2016, this transmission pipeline is now primarily used to supply Port Moody residential customer load which is significantly less than the design capacity of the pipeline.

- Section 4.2 describes the six alternatives that are available to achieve the Project Objective.
- Section 4.3 describes FEI's alternatives evaluation methodology, consisting of non-financial and financial criteria, used to evaluate the six alternatives.
- Section 4.4 describes how three alternatives were screened out as they were not technically feasible due to an inability to detect cracking threats or system constraints.
- Section 4.5 describes how two of the alternatives were screened out as they were not financial feasible due to high-level cost estimates approaching $2 billion.
- Section 4.6 describes how EMAT ILI is both technically and financially feasible, and the preferred alternative.
- Section 4.7 explains that PRS is required on one segment of pipeline that does not have the gas flow conditions required for EMAT ILI.
- Section 4.8 concludes this section by summarizing the results of the alternatives analysis.

4.2 ALTERNATIVES IDENTIFIED TO ENHANCE FEI'S CAPABILITIES TO MANAGE CRACKING THREATS ON FEI'S TRANSMISSION PIPELINES

FEI considered six alternatives to mitigate cracking threats on the 11 CTS pipelines that have been identified as susceptible to this threat. The six alternatives that are currently available to pipeline operators are:

- **Alternative 1:** Stress Corrosion Cracking Direct Assessment (SCCDA);
- **Alternative 2:** Pressure Regulating Station (PRS);
- **Alternative 3:** Hydrostatic Test Program (HSTP);
- **Alternative 4:** Electro-Magnetic Acoustic Transducer In-Line Inspection Program (EMAT ILI);
- **Alternative 5:** Pipeline Replacement (PLR); and
- **Alternative 6:** Pipeline Exposure and Recoat (PLE).

Each alternative is described in detail below.

4.2.1 Alternative 1 – Stress Corrosion Cracking Direct Assessment

Stress corrosion cracking direct assessment (SCCDA) is an integrity management approach developed by the National Association of Corrosion Engineers (NACE) International as detailed in the Standard Recommended Practice – Stress Corrosion Cracking (SCC) Direct Assessment

Methodology.[36] This approach is analogous to External Corrosion Direct Assessment (ECDA), which FEI currently uses a modified version of to detect metal-loss corrosion on many of its pipelines.

SCCDA consists of the following steps:

- **Pre-assessment:** collection and consideration of pipeline information (e.g., construction, vintage, coating type, 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. Above-ground surveys can provide information on coating imperfections[37] and areas of potential corrosion and cracking activity, such as where cathodic protection may not be at the required level to prevent corrosion. The above-ground measurements are not direct measurements of the level of cathodic protection at the pipe surface or precise measurements of coating condition. The surveys comprise electrical data obtained from above-ground, from which the level of cathodic protection at the pipe surface and coating condition are then inferred.
- **Direct Examination:** the data obtained during the pre-assessment and indirect inspection is analysed, pipe condition is inferred, and excavation sites that allow direct examination are selected. The pipeline is exposed at these sites and detailed inspection is conducted to confirm the presence or absence of SCC and the severity of the cracking present. Pipeline repair, replacement and/or recoat is performed on an as-needed basis.
- **Post Assessment:** the data from all preceding steps is analysed to confirm that the objectives have been met, to refine predictive models for where SCC is suspected to be present, to establish any further investigation to confirm pipe integrity (subject to the limitations associated with the inferred pipe condition), and to establish a re-inspection interval.
- **SCCDA Records:** all data obtained in the prior steps is collected and retained as a record of the decisions made during the SCCDA process.

The integrity of sections of the pipeline that were not exposed during the integrity dig is inferred based on the process above, including information collected at excavated sites. The number of excavations required depends greatly on the coating condition of the pipeline, the level of cathodic protection, and the severity and amount of SCC found.

36 ANSI/NACE Standard SP0204-2015.

37 Coating imperfections or holidays are areas where coating may be missing, degraded, or damaged. Commonly referred to as “coating holidays”.

4.2.2 Alternative 2 – Pressure Regulating Station

This alternative involves the installation of a pressure regulating station[38] (PRS) at the upstream end of a pipeline or segment of a pipeline to permanently lower the maximum operating pressure of a pipeline such that the resultant hoop stresses[39] are reduced to below 30 percent of the specified minimum yield stress (SMYS).[40]

As explained in Section 3.5.3.1, a pipeline operating at or above 30 percent of SMYS has a potential to fail by rupture, whereas a pipeline operating below 30 percent of SMYS has a potential to leak, rather than rupture. The potential consequences of a leak are significantly less than those of a rupture.

For gas pipelines operating at less than 30 percent of SMYS, Clause 12.10.3.3 of CSA Z662, which FEI is obligated to comply with per Section 3(1)(a) of the *Pipeline Regulation,* applies. This clause states:[41]

> Leak management shall be subject to the following requirements: …
>
> (c) Upon discovery, all leaks shall be immediately assessed and documented by competent personnel in accordance with the company's established guidelines to determine if a hazard exists. (…)
>
> (d) Where the condition of distribution or service lines, as indicated by leak records or visual observation, deteriorates to the point where they are not suitable in service, they shall be replaced, reconditioned, or abandoned."

This clause indicates that it is appropriate for an operator of a gas distribution system to wait for an occurrence of leaks on its system prior to implementing a significant condition monitoring program (such as a regular in-line inspection program) or mitigation (replacement, reconditioning, or abandonment).

Therefore, by bringing the pipeline hoop stress below 30 percent of SMYS, the PRS alternative mitigates the potential for rupture from cracking threats in a manner that satisfies FEI's obligations under CSA Z662 and the *Pipeline Regulation.*

4.2.3 Alternative 3 – Hydrostatic Testing Program

A hydrostatic testing program (HSTP) to verify the integrity of a transmission pipeline over its lifecycle involves periodically taking the pipeline out of service (e.g., at recurring intervals such as every five years) and subjecting it to a hydrostatic test. Hydrostatic testing can be used to confirm the integrity of pipelines that may have time-dependent threats such as corrosion and

---

[38] A pressure regulating station is a permanent installation that allows pressure regulation of natural gas via a control valve. It comes with fully redundant flow paths (2 x 100 percent capacity) with each flow path containing two control valves (main and monitor) capable of independently regulating pressure to avoid over pressure.

[39] The 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.

[40] The majority of pipelines in the CTS operate at hoop stress levels between 45 to 50 percent of SMYS.

[41] Clause 12.10.3.3, CAN/CSA Z662-190 – Oil and Gas Pipeline Systems.

cracking, construction damage, and/or manufacturing defects. Hydrostatic testing has been proven effective at safely removing near-critical axial flaws, such as SCC. By removing flaws that are approaching critical dimensions, a hydrostatic test helps prove the integrity of the pipeline, providing a margin of safety against an in-service failure for a period of time.

Hydrostatic testing of an existing pipeline is a complex process that involves:

- Developing a hydrostatic test plan, including planning for a temporary supply of gas to customers served by the test section.
- Isolating and removing the natural gas in the test section.
- Purging the test section of any remaining gas using nitrogen or air.
- Excavating and cutting test heads into the pipeline, which allow the test section to be filled with water.
- Evacuating residents within a pre-determined radius of the test section, including shutting down road crossings for the duration of the test.
- Sourcing and transporting to site the large volumes of water required to conduct the test.
- Filling the pipeline with water and bringing the pressure up to the calculated integrity test level, holding the pressure at the required level for a specified period of time (integrity test), reducing the test pressure to a calculated leak test level, and holding that pressure for a specified period of time (leak test). If a failure occurs during the integrity test, the failure location must be located, excavated and the pipe repaired, and the pipeline pressure test repeated until no more failures occur.
- Removing and disposing of the test water (or transporting and storing it for subsequent tests) followed by drying the test section using drying pigs[42].
- Removing temporary test heads and welding the test section back into the pipeline, followed by non-destructive testing of the tie-in welds.
- Purging the pipeline of air using natural gas.
- Restoring the pressure in the pipeline to normal operating pressure.
- Backfilling the exposed sections of pipe.

Hydrostatic testing has been used historically (i.e., prior to the availability of ILI tools) on pipelines where SCC failures have occurred or where near-critical cracking has been detected.

Hydrostatic testing does not identify the presence or absence of sub-critical cracks.[43] Any SCC or crack-like flaws that did not fail during the hydrostatic test can be expected to grow over time. Therefore, the pipeline would require periodic retesting to ensure continued integrity. Re-test

[42] Drying pigs are commonly made of foam and pushed through the pipeline using air after the hydrostatic test to absorb and remove any residual water from the test section.

[43] Sub-critical cracks or flaws are those that would survive an integrity hydrostatic test.

intervals are established using an engineering assessment, which includes calculating the maximum size of flaws that could have survived the hydrostatic test, growing these flaws using a reasonably conservative crack growth rate, and determining when the calculated failure pressure is below a specified factor of safety.

4.2.4 Alternative 4 – EMAT ILI Program

An EMAT ILI program involves periodically running an in-line inspection tool equipped with specialized sensors through the pipeline to detect anomalies or defects. These anomalies or defects are then analysed and integrity digs are performed to remove defects and validate the EMAT tool data. Anomalies or defects that could lead to pipeline failure in the foreseeable future are repaired or the affected segment of the pipeline is replaced.

EMAT ILI operates similarly to MFL and CMFL ILI tools used to manage external corrosion, but differs in its signal and sensor technology. MFL and CMFL tools use magnets to magnetize the steel pipeline. When metal loss is present, such as external corrosion, the magnetic field is disturbed, which the ILI tool then identifies through its sensors. In contrast, EMAT tools use a varying magnetic field to impart a force into the steel pipeline wall to generate sound waves. When a cracking anomaly or defect is present, such as SCC, the sound waves are interrupted, which the ILI tool then identifies through its sensors. The information from ILI tools are not direct measurements of the dimensions of anomalies and significant interpretation by the ILI vendor is required.

The frequency of ILI tool runs in FEI's CTS system is commonly set at every seven years, but may be shorter if required. The run frequency is determined on a pipeline-by-pipeline basis by analysis of the run results and other factors including operating history, pipeline availability for ILI (i.e., scheduling factors), and industry practice. It is not possible for FEI to establish its initial frequency of EMAT inspection with complete certainty in the absence of baseline EMAT ILI and subsequent integrity dig program results, and the frequency could also change over time as the various inputs change.

At present, EMAT tools are technically feasible and sufficiently commercialized to be employed as a mitigation measure in pipelines down to a nominal pipe size of 10 inches. To implement an EMAT ILI program, the following system and process improvements would be required:

- Pipeline alterations: required to address locations where speed excursions[44] may occur and where the ILI tool may not be able to pass through the pipeline. Pipeline alterations generally consist of cutting out the heavy wall features (e.g., fittings, pipe, etc.) causing speed excursions and replacing with higher grade pipe with a wall thickness that matches the rest of the pipeline.

[44] Speed excursions occur when an ILI tool travels outside the optimum range as provided by the ILI vendor and may be caused be pipeline fittings, wall thickness transitions, gas flow conditions, etc. Speed excursions result in partially or fully degraded data.

1 **Figure 4-1(a): Example of a Pipeline Alteration with Natural Gas Bypass – Before Cut Out**

2 

Figure 4-1(b): Example of a Pipeline Alteration with Natural Gas Bypass – After Cut Out

- Facility alterations: EMAT ILI tools are generally longer than CMFL and MFL tools. Therefore, launchers and receivers[45] located within existing FEI facilities must be modified to facilitate insertion and retrieval of the tool from the pipeline.

[45] Launchers and receivers are assemblies located at the upstream and downstream ends of a pipeline that are used to introduce and remove ILI and cleaning tools in a safe and effective manner.

Figure 4-2: EMAT ILI Tool being Inserted into a Launcher

- Flow control and pressure regulating stations[46]: speed excursions can also be caused by high gas flow rates in the pipeline, which propels the tool outside the optimum velocity range. Flow control station may be installed to allow for control of the gas flow rate in the pipeline being inspected, and ultimately the ILI tool velocity. Pressure regulating stations are required to allow for pressure reductions on the affected pipeline for operational responses, such as to establish a factor of safety if a significant cracking threat is found. The pressure reduction is typically by 20 percent, which corresponds to a 1.25 Safety Factor.

[46] When a pressure regulating station (PRS) is fabricated in a shop prior to transportation to site, it may be referred to as a "pressure regulating skid", as in the Appendices of this application.

Figure 4-3: Example of a Pressure Regulating Station

4.2.5 Alternative 5 – Pipeline Replacement

This pipeline replacement (PLR) alternative involves replacing the existing pipeline in its entirety with a new pipeline coated with a high integrity coating that is not conducive to the formation of SCC. Modern steel manufacturing practices and quality control programs also greatly reduce the likelihood of seam weld flaws on newly constructed pipelines, resulting in a pipeline that is less susceptible to cracking and constructed to current standards of design, material selection, and construction.

4.2.6 Alternative 6 – Pipeline Exposure and Recoat

This pipeline exposure and recoat (PLE) alternative involves exposing the entire length of a pipeline, removing the coating, inspecting 100 percent of the surface using non-destructive examinations, repairing any cracking or other anomalies discovered, and recoating the entire pipeline with a high integrity coating. The size of excavation required for this approach is greater than for replacing the pipeline, as the excavation would need to be sufficiently large to allow for coating removal, pipe inspection and repair, and in-ditch pipe recoating. The pipeline may need to be taken out of service, or operated at a reduced pressure, during the rehabilitation process. After the rehabilitation process, the pipeline would be reburied.

4.3 *ALTERNATIVES EVALUATION METHODOLOGY*

FEI evaluated the alternatives against three non-financial criteria and one financial criterion using a "Good-Acceptable-Poor Choice" rating system. FEI first assessed all of the alternatives against the non-financial criteria to determine their technical feasibility, and then assessed the three remaining alternatives using the financial criterion to assess their financial feasibility. The evaluation criteria, rating system, and results of the assessments are described in the subsections below.

4.3.1 Evaluation Criteria

The following criteria were used to evaluate the alternatives described in Section 4.2 above:

- Non-Financial:
  a. Method Effectiveness
  b. Implementation Complexity
  c. Community and Environmental Impacts
- Financial
  a. Net Present Value of Total Capital and O&M Costs

Each criterion is described in more detail below.

4.3.1.1 *Non-Financial*

The following non-financial evaluation criteria were used to evaluate all six alternatives:

a. Method Effectiveness

This criterion considers the effectiveness of the alternative in enhancing FEI's ability to mitigate in-service pipeline failures resulting from time-dependent cracking threats. Alternatives that can identify and locate cracking threats for mitigation, or eliminate cracking threats, are rated highest.

b. Implementation Complexity

This criterion considers how easily the alternative can be implemented on FEI's system and the relative complexity of performing the alternative. Factors contributing to the complexity of an alternative may include:

- Relative impact of the proposed construction methodology. An alternative that requires significant impacts or changes to system operation during implementation would be rated low while one with minimal impacts would be rated high.

- Available system capacity. An alternative that would result in a loss of customers without major system alterations would be rated low, while ones that fit within the existing system capacity would be high.
- Land and workspace requirements. An alternative that stays within the existing FEI SRW with minimal impacts to the surrounding lands would be rated highly.

c. Community and Environmental Impacts

This criterion considers the potential effects on the community and environment while performing field activities associated with each alternative. Alternatives that minimize the following are rated higher:

- Impacts to community infrastructure;
- Impacts to private properties and businesses;
- Road closures and other traffic impacts;
- Displacement / evacuation of residents;
- Time duration and frequency of impact to residents and businesses;
- Management of waste, emissions, and/or contamination; and
- Impacts to the surrounding environment (vegetation, soil, watercourses).

4.3.1.2 *Financial*

The following financial criterion was used to evaluate the three alternatives remaining after the non-financial assessment:

a. Net Present Value of Total Capital and O&M Costs

The alternatives proposed can be categorized into two types of integrity management strategies, which impacts the net present value of the alternative:

- **On-going active monitoring:** cracks are monitored and managed through on-going activities, usually performed on a specified time interval (e.g., every seven years), as part of an integrity management program.
- **Direct management:** susceptible pipelines are either replaced or refurbished thereby eliminating crack threats, or new permanent infrastructure is installed allowing for significant and long-term reduction in the risk of cracking.

Given the differing spend profiles of the two types of strategies, with the latter having a higher upfront and minimal ongoing costs, while the former has smaller upfront with more significant ongoing costs, this criterion considers the net present value (NPV) of the total cost of the alternative, including:

- One time capital costs associated with implementation of the alternative.
- Increases and/or decreases in ongoing capital and O&M costs.

4.3.2 Rating System for the Evaluation Criteria

FEI used a “Good-Acceptable-Poor Choice” rating system to independently evaluate the alternatives using the evaluation criteria described in the previous section. The ratings were determined through collaborative discussions with FEI’s subject matter experts. Table 4-2 below describes the relationship between a green, yellow or red rating and the impact associated with each alternative. Red ratings were generally given for alternatives that were not feasible, whether for technical or financial reasons.

Table 4-2: Rating Definitions

Rating Color	Impact Evaluation
✓	**Good choice:** Minimal concerns or risks; most effective
-	**Acceptable choice:** Moderate concerns or risks; partially effective
×	**Poor Choice:** Significant concerns or risks; not effective

4.3.3 Results of Alternatives Assessment

The following table provides a summary of FEI’s assessment of the six alternatives against the non-financial and financial evaluation criteria outlined in Section 4.3.1. Based on the ratings presented in Table 4-3 and the non-financial assessment below, FEI determined Alternatives 1, 2 and 3 to be not technically feasible with respect to managing cracking threats in the CTS. FEI then evaluated the remaining three alternatives against the financial criterion and determined Alternatives 5 and 6 to be not feasible due to significantly higher costs than Alternative 4. The results of the evaluation indicate that Alternative 4: EMAT ILI is the preferred alternative.

Table 4-3: Summary of Alternatives Assessment

	Non-Financial			Financial
	Method Effectiveness	**Implementation Complexity**	**Community and Environmental Impacts**	**Net Present Value**
Alternative 1: SCCDA	×	✓	-	n/a
Alternative 2: PRS	✓	×	✓	n/a
Alternative 3: HSTP	-	-		n/a
Alternative 4: EMAT ILI	✓	✓	✓	✓
Alternative 5: PLR	✓	×	×	×
Alternative 6: PLE	✓	-	×	×

Method Effectiveness

Alternatives 2, 4, 5 and 6 are rated as “good choices” for method effectiveness as they allow FEI to significantly and confidently reduce the risk of rupture due to cracking, as follows:

- Alternative 2: PRS lowers the operating stress of the pipelines to below 30 percent of SMYS. As described in Sections 3.5.3.1 and 4.2.2, pipelines operating at or below 30 percent of SMYS are more likely to leak rather than rupture which has significantly lower consequences.
- Alternative 4: EMAT ILI allows FEI to collect data continuously to identify and qualify cracks on its susceptible pipelines. FEI can confirm this data and then perform repairs at the most critical locations. Additionally, by repeating EMAT ILI runs at a certain frequency, FEI can monitor and predict the growth of sub-critical cracks to ensure they do not grow to failure.
- Alternatives 5: PLR and 6: PLE both allow for the elimination of cracks through either complete replacement of the pipeline with modern steel which is less susceptible to cracking, or by exposing the entire pipeline, inspecting it for cracking, and recoating it.

Alternative 3: HSTP is rated as an "acceptable choice" as it is an effective method for removing critical cracking threats by failing them out. However, HSTP does not provide the capability of identifying and locating sub-critical cracks. Therefore, the HSTP alternative does not give FEI as much visibility of cracking on its system as other on-going active monitoring methods.

Alternative 1: SCCDA is rated as a "poor choice" as it cannot reliably identify locations of critical or sub-critical cracking due to its reliance on indirect data (e.g., coatings, cathodic protection, etc.). As explained further in Section 4.4.1 below, SCC is a random phenomenon making identification through indirect assessments difficult and inefficient. As such, FEI cannot rely on this method to prevent ruptures caused by cracking.

Implementation Complexity

Alternatives 2 and 5 are rated as "poor choices" due to the following significant challenges with their implementation:

- Alternative 2: PRS, the 11 CTS pipelines are currently incapable of maintaining reliable gas supply to existing customers if operated at a lower pressure in order to achieve hoop stresses at or below 30 percent of SMYS. Thus, if this alternative were implemented FEI would be at risk of losing customers, which is not acceptable to FEI.
- Alternative 5: PLR considers that new pipeline would be installed within FEI's existing statutory rights-of-way (SRW). CTS pipelines are located in highly urban areas and as shown in Figure 3-16, some SRWs are occupied by multiple transmission pipelines. The installation of another transmission pipeline would be difficult and may require the removal, instead of abandonment, of existing pipelines in order to maintain adequate clearance between pipelines.

The remainder of the alternatives are either "acceptable" or "good" choices as they can be reasonably implemented on FEI's 11 CTS pipelines. In general, Alternatives 1 and 4 are better choices because they are the least disruptive due to fewer or less complex system alterations required to ready the system.

Community and Environmental Impact

Alternatives 5 and 6 are rated as "poor choices" due to significant excavation requirements in close proximity to public and private infrastructure, as well as potentially environmentally sensitive areas. Since a hydrostatic test could fail resulting in the release of pressurized water, Alternative 3 is also rated as a "poor choice" as there can be significant impacts, such as evacuation of nearby residents, to the community in order to set up a safe testing zone.

The remainder of alternatives are either "acceptable" or "good" choices as they have minimal to impacts on the community and environment, with minimal excavation requirements and work mainly occurring within FEI's existing SRWs and facilities.

Net Present Value

As discussed in Section 4.3.1.2, the alternatives compared using the financial criterion can be categorized into two types of integrity management strategies, which impacts the net present value of the alternative:

1. **On-going active monitoring:** Alternative 4 is an on-going active monitoring method.
2. **Direct management:** Alternatives 5 and 6 constitute direct management as each requires a one-time installation of new permanent infrastructure to allow for crack-related rupture management.

On-going active monitoring is typically the most cost-effective long-term asset management option when it can be effectively employed as it allows for targeted crack mitigation, meaning the most critical threats can be prioritized and repaired. Without current capabilities for reliably identifying the specific location of cracks, direct management alternatives must be applied to the entirety of a pipeline that has been identified as susceptible to cracking. As a result, Alternatives 5 and 6 are significantly more costly than Alternative 4 and were ranked as "poor choices." A high-level financial analysis of these three alternatives can be found in Section 4.5.

4.4 ALTERNATIVES SCREENED OUT AS NOT TECHNICALLY FEASIBLE

Based on its evaluation of the six alternatives using the non-financial criteria described above, FEI determined Alternatives 1, 2 and 3 to be not technically feasible. Technically feasibility relates to an alternative's ability to be implemented on FEI's 11 CTS pipelines to mitigate cracking threats. Alternative 1 is not feasible due to its inability to identify critical cracking threats, while Alternatives 2 and 3 are not feasible based on significant system constraints. Further details regarding the elimination of these alternatives is provided in the following sections.

4.4.1 Alternative 1: SCCDA Cannot Reliably Identify Cracking Threats

Effective management of SCC threats requires identifying and appropriately addressing the areas of highest potential SCC failure, which are areas with the worst SCC, before those cracks grow to failure. Based on a review of industry publications on SCC, it is generally acknowledged that SCCDA is not considered an effective tool for managing SCC. The reasons are as follows:

- SCC crack initiation, or the start of cracking at the surface of the pipeline, is heavily influenced by localized residual stresses, coating disbondment and the environment around the pipeline. SSCDA does not provide guidance for detecting localized residual stresses and only provides partial guidance on the detection of coating disbondment and environmental conditions. As such, SCC can be highly randomized and unpredictable along a susceptible pipeline. Due to the random nature of crack initiation, it is reported that it is not possible to reliably identify where SCC is likely to occur or identify the areas that are most likely to have significant cracking through a dig program;[47] and
- While existing assessment approaches, such as soil models "may help identify SCC susceptible segments, they have limited value in pin-pointing the location of the deepest crack."[48]

That is, SCCDA cannot be counted on to reliably identify the most significant, and hence most likely to fail, SCC defects on the pipeline. Therefore, on its own, it is not considered an effective approach to SCC integrity management. Additionally, the SCCDA method was not developed to manage crack-like imperfections in seam welds.

NACE, which developed this approach, states that SCCDA should be complementary to other inspection methods such as ILI or hydrostatic testing.[49] SCCDA is not an alternative or replacement for these methods but can be used to prioritize these other integrity methods "if SCC is found that is sufficient to warrant general mitigation."[50] That is, SCCDA can be used to assess lines to determine if SCC is a potentially significant threat that would then be mitigated through ILI or pressure testing. The analysis conducted by FEI to date has already identified that SCC is a credible threat for the specified lines.

In its Safety Study: Integrity Management of Gas Transmission Pipelines in High Consequence Areas,[51] the U.S. National Transportation Safety Board made the recommendation to the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) that they "develop and implement a plan for eliminating the use of direct assessment as the sole integrity assessment method for gas transmission pipelines". PHMSA stated that "SCCDA is not as effective and

---

47 Stress Corrosion Cracking on Canadian Oil and Gas Pipelines, National Energy board , 1996, MH–2-95.

48 *Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience (Phase I and II)*, Integrity & Inspection of Technical Committee of Pipeline Research Council International, Contract PR-328-083501 (Contract Project No.: PRC-U212-014), 13 Sept. 2017.

49 Stress Corrosion Cracking on Canadian Oil and Gas Pipelines, National Energy board , 1996, MH–2-95.

50 NACE SP024-2015 *Stress Corrosion Cracking (SCC) Direct Assessment Methodology.*

51 NTSB/SS-15/01 PB2015-102735, Safety Study: Integrity Management of Gas Transmission Pipelines in High Consequence Areas.

does not provide an equivalent understanding of pipe conditions with respect to SCC defects as ILI or hydrostatic pressure testing."[52]

Additionally, FEI is aware through its participation in industry groups that its peers do not regard this method as effective in comparison to the other alternatives identified for the CTS TIMC Project.

Since SCCDA cannot reliably identify the worst case SCC cracking that can grow to failure, it is unable to achieve the Project Objective of mitigating cracking threats on the 11 CTS pipelines susceptible to cracking. Therefore, SCCDA was not considered further in the evaluation process.

4.4.2 Alternative 2: PRS Leads to System Capacity Limitations

PRS can be highly effective in reducing the likelihood for SCC to cause an in-service pipeline rupture, as these SCC threats would instead be expected to result in leaks.

However, pressure reduction creates significant operational challenges when applied to FEI's CTS. Due to the interconnected nature of the 11 CTS pipelines identified as part of the TIMC Project, PRS is not viable when applied to the pipeline system because of capacity limitations. As described in Section 4.2.2, the PRS alternative involves permanently lowering the maximum operating pressure of a pipeline such that the resultant hoop stresses are reduced to below 30 percent of SMYS. The majority of pipelines in the CTS operate at hoop stress levels between 45 to 50 percent of SMYS and therefore, the maximum operating pressure of the CTS would need to be reduced by approximately 40 percent to achieve the desired stress levels. This would lead to a significant reduction in the capacity available to customers in the Lower Mainland and Vancouver Island.

At reduced operating pressures, the capacity requirements of the system under current peak day demand cannot be met and extensive system looping would be required to meet current and future gas supply needs. FEI relies on CTS pipeline interdependencies to manage operational activities and ensure reliability and resiliency of the Coastal gas transmission and distribution system. FEI's operational flexibility would be impacted resulting in a reduced ability to plan and perform maintenance and construction work, establish line pack needs and move gas through the system.

With the exception of the Noon's Creek to Burrard 508 pipeline connecting the Noon's Creek Valve Assembly and decommissioned Burrard Thermal Plant in Coquitlam, implementation of PRS on the 11 CTS pipelines would result in FEI being unable to maintain reliable service to its customers. As such, PRS was deemed not technically feasible for system wide application to all 11 interconnected CTS TIMC pipelines and was not considered further in the evaluation process. The NOO BUR 508 exception is discussed in Section 4.7.

[52] NPRM Part 192 Vol. 81 No.68, US Department of Transportation.

4.4.3 Alternative 3: HSTP has Significant Operational Challenges in an Urban Environment

While HSTP is currently used in FEI's integrity management program as part of its construction verification activities, it is not considered effective as a method for managing SCC and cracking threats on operating gas lines for the following reasons:

- Hydrostatic pressure testing does not provide any information on crack growth rates or identify the development of new sub-critical SCC[53], both of which can be assessed by ILI[54]; and
- There have also been published studies regarding the potential for sub-critical SCC cracks that have not been failed out through hydrostatic pressure testing to be made more severe through this process.[55]

The urban environment surrounding the CTS pipeline system amplifies the challenges associated with running a hydrostatic testing program, as the number of occupied residences and businesses in close proximity to the pipeline need to be considered. Figure 4-4 shows a typical pipeline statutory right of way (SRW) in the area served by the CTS.

[53] David Katz, Steve Potts, Ralf Weber, Joerg Grillenberger, Thomas Beuker, "In-Line Inspection Technology for Crack Detection In Gas Pipelines," IBP2387_17, Brazilian Petroleum, Gas and Biofuels Institute – IBP, 2017.

[54] Ibid.

[55] Jian Li, M. Elboudjdaini, M. Gao, R. W. Revie, "Hydrostatic Testing as an Integrity Management Tool," *API Technical Report 1179*, first edition; "Investigation of plastic zones near SCC tips in a pipeline after hydrostatic testing," *Materials Science and Engineering A*, Volume 486, Issues 1-2, 15 July 2008, 496-502; "In-Line Inspection Technology For Crack Detection In Gas Pipelines," IBP2387_17, Brazilian Petroleum, Gas and Biofuels Institute – IBP, 2017.

Figure 4-4: Typical FEI SRW in an Urban Environment Running through Residential Backyards

The operational, community and environmental challenges resulting from the urban environment in which FEI's CTS operates render this alternative unsuitable for general use. These challenges include:

- Work sites up to two acres may be required for setup and staging,[56] which can be challenging to source in the densely populated areas where the CTS pipelines operate.
- There is a potential for service disruptions should a pipeline be out of service for extended periods during the hydrostatic test.[57] For example, if a test failure occurs, time would be required to locate the point of failure and make the necessary repairs.
- Public notifications and evacuations may be required to establish safe testing zones.[58]
- It may be difficult to locate leaks and there may be challenges containing released water due to urban infrastructure (e.g., sidewalks and buildings) in and around the pipeline.
- Containment challenges if the test fails resulting in the release of water.
- There is a potential for release of contaminated water, leading to environmental clean-up issues.
- Requirements to dispose of contaminated water post-test.

---

56 CEPA Recommended Practices for Managing Near-neutral pH SCC, 3rd edition, May 2015

57 Dynamic Risk Assessment Systems, Inc. ATCO Urban Pipeline Replacement Project Application No. 1608617 Appendix 3(A) Consequence Evaluation of Urban Pipeline Projects, Feb 2013.

58 INGAA Technical, Operational, Practical, and Safety Considerations of Hydrostatic Pressure Testing Existing Pipelines, 2003; ATCO Pipelines Pipeline Replacement Project Application, March 2013.

As such, HSTP was deemed not technically feasible for system wide application to the 11 CTS pipelines and was not considered further in the evaluation process.

4.5 ALTERNATIVES SCREENED OUT AS NOT FINANCIALLY FEASIBLE

FEI calculated and compared the net present value (NPV)[59] of the total cost for Alternatives 4, 5, and 6. To determine the NPV, FEI used the base cost estimate for each alternative including owner's costs and a 2 percent per year escalation rate. For Alternative 4, FEI has included the base cost estimate at an AACE Class 3 level of project definition. For Alternatives 5 and 6, the base cost estimates are AACE Class 5. Due to early indication that the costs for Alternatives 5 and 6 were prohibitive, they were not refined any further.

The costs of each alternative were analysed over a 70-year analysis period and included both capital and ongoing O&M costs. The 70-year analysis period is used based on the 65-year average service life of a transmission main asset plus a construction period of 5 years. The 65-year post-project analysis period is the average service life of the transmission mains pooled asset account[60] as detailed in FEI's 2017 Depreciation Study[61].

Factors included in each of the options are as follows:

- Alternative 4: EMAT ILI
  a. Capital costs associated with initial system alterations; and
  b. Ongoing capital and O&M costs associated with regular integrity management activities (EMAT ILI runs, follow-up repair work, etc.)
- Alternative 5: PLR
  a. Capital costs associated with replacing the existing transmission pipelines; and
  b. Reduction in current baseline O&M costs, as new pipe would require fewer pipe condition assessment digs.
- Alternative 6: PLE
  a. Capital costs associated with exposing and recoating the existing transmission pipelines; and
  b. Reduction in current baseline O&M costs, as the fully inspected and newly coated pipe would require fewer pipe condition assessment digs.

[59] FEI did not complete full cost of service analysis to compare remaining three Alternatives (i.e., Alternative 4, 5 and 6). Alternatives 5 and 6 were screened out as they were not financial feasible due to the high-level cost estimates approaching $2 billion. Due to the large difference in cost analysing these alternatives using cost of service approach would not alter FEI's determination to not pursue Alternatives 5 and 6.

[60] Asset Class 46500.

[61] Approved with Order G-165-20.

As the current extent of cracking on the 11 CTS pipelines is unknown and cannot be determined without additional inspection capabilities, Alternative 5: PLR and 6: PLE consider replacement or exposure and recoating of the pipelines in their entirety. As a result, these two alternatives have very high costs.

Table 4-4 below shows the results of the financial cost comparison. A high level financial analysis for each alternative cost can be found in Appendix G-1.

Table 4-4: NPV Cost Comparison of Three Remaining Alternatives (2020$)

	Alternative 4: EMAT ILI ($ millions)	Alternative 5: PLR ($ millions)	Alternative 6: PLE ($ millions)
NPV of Capital Cost	$225	$1,818	$1,909
NPV of O&M Costs (Savings)	$82	$(7)	$(7)
NPV of Total Capital and O&M Costs	$307	$1,811	$1,902

Based on the NPV of costs for the remaining three alternatives, it is clear that Alternatives 5 and 6 are cost prohibitive as compared to Alternative 4 and therefore are considered to be not financially feasible. FEI did not pursue Alternatives 5 and 6 further in the evaluation process.

4.6 ALTERNATIVE 4: EMAT ILI IS THE ONLY FEASIBLE ALTERNATIVE TO ACHIEVE THE PROJECT OBJECTIVE

Based on the results of the alternatives evaluation, EMAT ILI is the sole option that is both technically and financially feasible and is therefore the preferred alternative to achieve the Project Objective.

EMAT ILI is highly effective for managing cracking threats as it is capable of identifying, locating, and sizing cracking defects.[62] EMAT ILI provides insight into imperfections and defects that would not fail a hydrostatic pressure test, for both SCC and sub-critical long seam weld features. The detection and sizing capability of EMAT ILI enables identification of specific sites on the pipeline that have critical as well as larger sub-critical cracking. Further, given the ongoing availability of updated ILI information, FEI can actively monitor and manage cracking threats in the most cost effective manner, by prioritizing mitigation of those cracks posing significant threats. The data collected through an EMAT ILI program can be utilized in FEI's on-going QRAs to better inform integrity management activities related to time-dependent threats.

With some system alterations, EMAT ILI can be implemented on the 11 CTS pipelines (with the exception of the tail end of the NOO BUR 508, further discussed in Section 4.7) and has less impact on the community or environment as compared to other alternatives. Details of the required alterations are set out in Section 5 of the Application. As detailed in Section 5.3.3, FEI

[62] To be found by the EMAT tool, the defects must be larger than the detection threshold of the tool.

has undertaken a pilot project in which FEI altered two segments of pipeline and successfully ran EMAT ILI tools. This pilot project demonstrates the feasibility of EMAT ILI for FEI's system.

The financial analysis described above and Project cost estimate described in Section 5 shows that this alternative is financial feasible.

FEI's selection of an EMAT ILI program to enhance its capabilities for mitigating cracking threats aligns with FEI's peer operators. As discussed in Section 3.3.2, EMAT ILI is increasingly being adopted by industry for managing cracks and crack-like imperfections on transmission pipelines and enabling the mitigation of their potential for rupture. Gas transmission operators are having success with this approach to crack management and, as such, the use of EMAT crack detection ILI is rapidly becoming the industry standard for managing cracking threats on transmission pipelines which have the potential for significant consequences should failure occur.

4.7 EXCEPTION NEEDED FOR A SEGMENT OF THE CPH BUR 508 TRANSMISSION PIPELINE

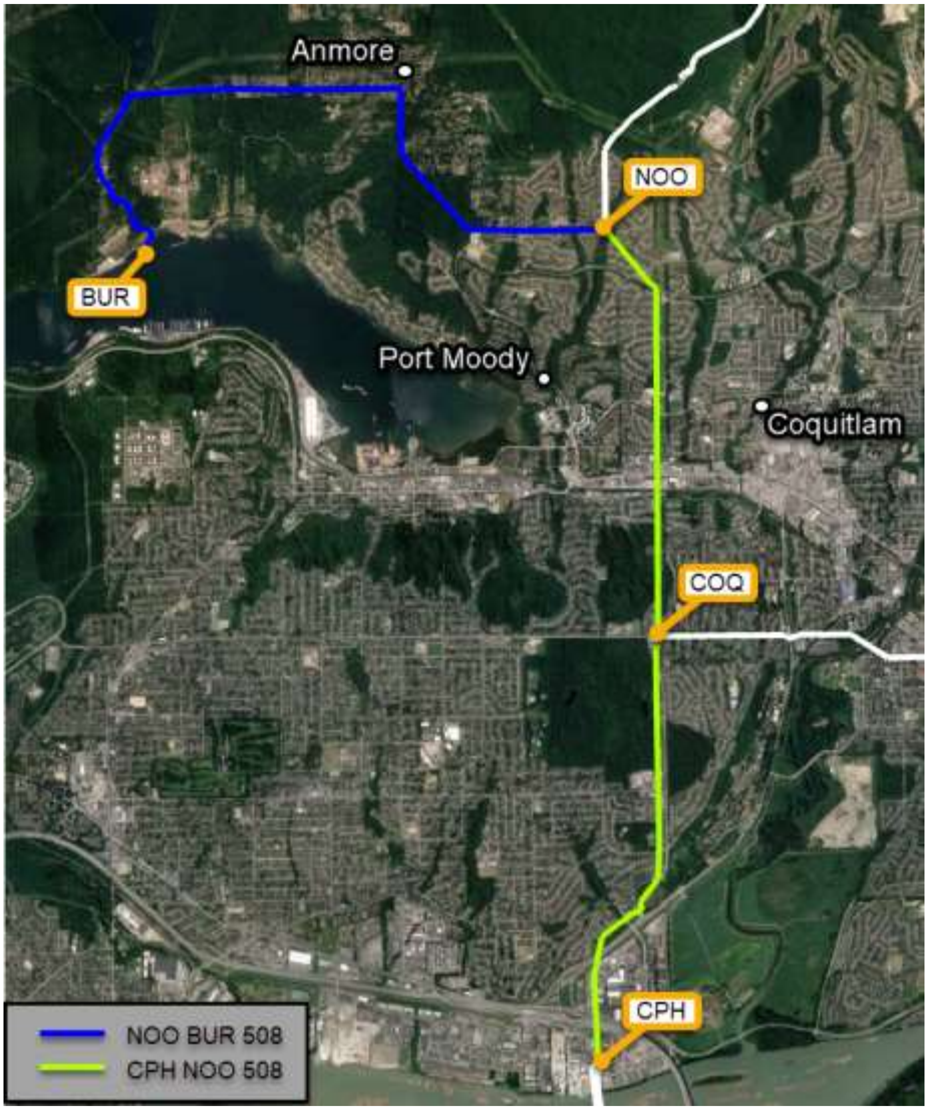
An EMAT ILI tool is required to travel within a certain velocity range in order to collect reliable ILI data. For the tail end of the Cape Horn to Burrard 508 transmission pipeline, there is insufficient gas demand to generate the required flow to propel the ILI tool through the pipeline. As a result, for this segment of pipeline, FEI considers that PRS is the most cost effective way to meet the Project Objective.

4.7.1 FEI Cannot Currently Run ILI Tools in the NOO BUR 508 Segment Due to Insufficient Gas Flow Conditions

As shown in Figure 4-5, the CPH BUR 508 transmission pipeline can be separated into the following two segments:

1. Cape Horn to Noon's Creek (CPH NOO 508), which is approximately 9 km
2. Noon's Creek to Burrard (NOO BUR 508), which is approximately 8 km

Figure 4-5: CPH BUR 508 Transmission Pipeline



The NOO BUR 508 segment faces significant challenges with ILI due to insufficient gas flow conditions resulting in the inability to move any ILI tool through the pipeline at the velocities required to obtain quality data. These insufficient gas flow conditions exist because:

1. NOO BUR 508 is at the tail-end of the CTS system and dead-ends at BC Hydro's Burrard Thermal natural gas-fired power generation plant, which ceased operation in 2016.
2. The Burrard Thermal plant was originally the largest demand source on this pipe lateral and justified the basis for pipe size and operating pressure on the NOO BUR 508 segment. As a result of the plant decommissioning, this segment has significant excess capacity at the current operating pressure to serve the remaining system demand.

3. Currently, NOO BUR 508 feeds three gate stations, which have relatively small load demands.

As such, FEI selected an alternative approach to meet the Project Objective for this segment of pipeline.

4.7.2 PRS is FEI's Preferred Approach for Mitigating Cracking Threats on NOO BUR 508

PRS is an effective method for managing cracks with limited impacts to the surrounding community and environment. As stated in Section 4.2.2, pipelines operating at lower stresses have the potential to leak rather than rupture, reducing the consequences of a failure.

When PRS was considered for system wide application to all 11 CTS TIMC pipelines, there were significant negative impacts to the capacity, reliability and resiliency of the system identified. However, a review of the capacity on the NOO BUR 508 segment indicates that it has sufficient capacity to meet the load demands of customers at a lower maximum operating pressure. An individual application of the PRS alternative to the NOO BUR 508 segment is viable due to its location at the tail-end of the CTS and its current operational requirements. At its reduced pressure, the NOO BUR 508 segment will no longer be considered a transmission pipeline and data regarding cracking is not required.

4.8 *CONCLUSION*

To achieve the Project Objective, FEI's alternatives analysis concluded that EMAT ILI is the preferred and only technically and financially feasible alternative for the CTS TIMC Project. However, FEI's analysis also concluded that PRS is a cost-effective solution to mitigate cracking threats on the NOO BUR 508 segment of the CPH BUR 508 transmission pipeline, as it does not have the gas flow conditions required to move an ILI tool through the pipeline. A summary in table form can be found in Table 4-5.

Table 4-5: Preferred Alternatives for Each Pipeline Segment

#	CTS Pipeline/Segment Name		Approximate Length	Preferred Solution
1	HUN NIC 1066	Huntingdon – Nichol 42"	55 km	EMAT ILI
2	HUN NIC 762	Huntingdon – Nichol 30"	56 km	EMAT ILI
3	LIV COQ 323	Livingston – Coquitlam 12"	35 km	EMAT ILI
4	LIV PAT 457	Livingston – Pattullo 18"	30 km	EMAT ILI
5	NIC PMA 610	Nichol – Port Mann 24"	5 km	EMAT ILI
6[1]	CPH NOO 508 NOO BUR 508	Cape Horn – Noon's Creek 20" Noon's Creek - Burrard 20"	9 km 8 km	EMAT ILI PRS
7	ROE TIL 914	Roebuck – Tilbury 36"	13 km	EMAT ILI
8	TIL BEN 323	Tilbury – Benson 12"	6 km	EMAT ILI

#	CTS Pipeline/Segment Name		Approximate Length	Preferred Solution
9	TIL FRA 508	Tilbury – Fraser 20”	10 km	EMAT ILI
10	NIC FRA 610	Nichol – Fraser 24”	24 km	EMAT ILI
11	TIL LNG 323	Tilbury – LNG Plant 12”	2 km	EMAT ILI
Total Length of CTS TIMC Pipelines			**254 km**	

<u>*Note:*</u>

[1] Pipeline #6 is a single pipeline from Cape Horn to Burrard (CPH BUR 508) through Noon’s Creek. As discussed above, risk to the two segments is being mitigated in different ways.

5. PROJECT DESCRIPTION

5.1 INTRODUCTION

In this section, FEI describes the CTS TIMC Project in detail based on the selected EMAT ILI alternative described in Section 4. FEI describes the Project components consisting of pipeline and facility modifications, the project development activities, schedule, resource requirements, construction management, required permits and approvals, and cost estimate. FEI also describes the post-project work that is anticipated to follow once FEI begins running the EMAT ILI tools on the CTS.

This section is organized as follows:

- Section 5.2 provides an overview of the Project and describes the rationale for performing alterations to the pipelines and their associated facilities in preparation for EMAT ILI runs.
- Section 5.3 provides a history of the Project development activities, including the approval of the Development Costs deferral account. FEI also describes the work performed to date which has enhanced FEI's understanding of EMAT inspection and helped refine the scope of alterations.
- Section 5.4 describes the modifications to the pipelines that are necessary for the collection of full resolution ILI data;
- Section 5.5 describes the modifications required to the facilities associated with the 11 pipelines that are necessary to run EMAT ILI tools and to respond to any anomalies found as a result of the in-line inspections;
- Sections 5.6 to 5.9 describes schedule, project resource requirements and management;
- Section 5.10 provides basis of the cost estimate, and the processes undertaken to validate the estimate including risk assessment and contingency determination.
- Section 5.11 describes post-Project work following the completion of alterations described in Sections 5.4 and 5.5.

5.2 OVERVIEW OF PROJECT COMPONENTS

The CTS TIMC Project consists of the work necessary to ready the CTS for EMAT ILI tool runs. Table 5-1 below provides an overview of the Project components and how they advance the Project Objective.

Table 5-1: Overview of Project Components

Key Project Component	How Component Serves Project Objective
Project Development Activities	FEI's project development activities consisted of the work that was done to develop this Project to its current level of definition: • QRA to inform the Project, including priority and urgency, as described in Section 3.4.4 • A pilot project to test EMAT ILI tool behaviour in FEI pipelines, as described in Section 5.3.3 • Scope development, FEED level engineering, and cost estimating required to define the Project to an appropriate level for this Application.
Alterations to six CTS pipelines, consisting of the replacement of 13 heavy wall segments	The replacement of the 13 heavy wall segments will enable the EMAT ILI tool to travel within its optimal velocity range, which is critical for the collection of full resolution ILI data. This project component is described in detail in Section 5.4.
Alterations to 13 CTS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure, flow and backflow regulating capability	Alterations at 13 transmission pressure facilities will: 1) Allow EMAT ILI tools to be inserted into the pipelines and provide FEI with the capability to alter flowrates and pressures, and to prevent backflow, in the pipelines as needed to run EMAT ILI tools. 2) Allow for permanent pressure reduction to the NOO BUR 508 pipeline segment This project component is described in detail in Section 5.5.

While FEI has been running geometry, MFL-A and MFL-C tools in the CTS pipelines for many years, EMAT ILI tools have a different set of system readiness criteria as they are longer than other ILI tools and require different conditions for a successful run. The system readiness criteria for EMAT ILI tools are set out in Appendix D-1, and can be summarized as follows:

1. Can the EMAT ILI tools be introduced into the pipelines using existing infrastructure? The existing launching and receiving facilities were designed to accommodate geometry, MFL-A and MFL-C ILI tools which are shorter than EMAT ILI tools.
2. Can the EMAT ILI tools successfully navigate these pipelines? Are there any locations on these pipelines where a certain feature or pipeline geometric feature can stop the tool from navigating through them? A feature which may not have been a problem for the geometry, MFL-A and MFL-C tools might be a problem for the EMAT ILI tools because EMAT ILI tools are longer and react differently to changes in conditions than these other tools.
3. Can the EMAT ILI tools, which are dependent on the gas flow for propulsion, navigate through these pipelines within its optimal velocity range? Navigation of EMAT ILI tools within its optimal velocity range is critical for collection of good quality data which is impacted by the conditions in which the tool is operating e.g. gas flow rates, heavy-wall pipe, etc.

4. If an integrity concern is detected by the EMAT ILI run, is the system ready to ensure safe continued operation while meeting FEI's obligation to provide gas to its customers?

As summarized in Table 5-1 above, to meet the system readiness criteria, 13 heavy wall pipeline segments need to be replaced and 13 facilities need alterations in order to be able to launch and receive the longer EMAT ILI tools and install the capability to alter flowrates and pressures and prevent backflow in the pipelines.

A summary of the number of alterations required on each of the 11 CTS pipelines and a list of the associated facilities requiring alterations to ready the system for EMAT ILI inspection is set out in Table 5-2 below.

Table 5-2: Pipelines and Facilities within Project Scope

<table>
<tr><th>Pipeline</th><th>Number of alterations required</th><th>Facilities Requiring alteration</th></tr>
<tr><td>HUN ROE 1067</td><td>1</td><td rowspan="11">Huntingdon Control Station[63];
Livingstone Regulating Station;
Nichol Valve Station;
Roebuck Valve Station;
Port Mann Valve Station;
Tilbury Regulating Station;
Tilbury LNG Plant Station;
Benson Regulating Station;
Fraser Gate Station;
Cape Horn Valve Station;
Coquitlam Gate Station;
Noons Creek Valve Station; and
Anmore Regulating Station</td></tr>
<tr><td>HUN NIC 762</td><td>2</td></tr>
<tr><td>LIV COQ 323</td><td>1</td></tr>
<tr><td>CPH BUR 508</td><td>5</td></tr>
<tr><td>TIL FRA 508</td><td>2</td></tr>
<tr><td>TIL BEN 323</td><td>2</td></tr>
<tr><td>LIV PAT 457</td><td>None</td></tr>
<tr><td>NIC FRA 610</td><td>None</td></tr>
<tr><td>ROE TIL 914</td><td>None</td></tr>
<tr><td>NIC PMA 610</td><td>None</td></tr>
<tr><td>TIL LNG 323</td><td>None</td></tr>
</table>

FEI describes the required pipeline and facility alterations in Sections 5.4 and 5.5, respectively.

5.3 *PROJECT DEVELOPMENT ACTIVITIES*

5.3.1 The Need for the TIMC Project Was Identified in Previous Regulatory Processes

The potential need to address cracking in FEI's transmission pipelines was first mentioned in September 2016 during the FEI Annual Review for 2017 Delivery Rates proceeding. In response to BCUC IR1 9.11, which asked how ILI activity had changed since the commencement of the 2014 PBR term, FEI responded that:

[63] Huntingdon Control Station may be referred to as Huntingdon Regulating Station in the appendices.

> "FEI expects ongoing evolution of its in-line inspection program. Significant current initiatives under evaluation include: […]
>
> - The need for and feasibility of adopting crack-detection capabilities within its in-line inspection program"

In August 2018, FEI first introduced the need for the CTS TIMC Project in its application for the Annual Review for 2019 Delivery Rates. During that process, FEI requested approval of a new, non-rate base deferral account to capture the development costs for the TIMC Project. At that time, it was stated:

> "FEI has initiated the development of the TIMC project, which will consist of modifications to FEI's transmission pipeline system to enable inline inspection with recently proven and commercialized crack-detection tools (commonly referred to as "EMAT tools", as the technology relies upon electro-magnetic acoustic transducers)."[64]

FEI also explained that it intended to apply a two-phase approach to the development of the project. In broad terms, the activities within the two phases were characterized as:

- Phase 1 – involved conducting a quantitative risk assessment of FEI's transmission pipeline assets; and
- Phase 2 – comprised the front-end engineering and design and other CPCN development costs, such as environmental assessments, and Indigenous and stakeholder consultation.

In Decision and Order G-237-18, the BCUC approved FEI's request to establish a non-rate base deferral account, attracting a WACC return, for the development costs related to the TIMC project. In its Decision, the BCUC also noted the atypical nature of the deferral account request. In response to concerns regarding the magnitude and uncertainty of both the deferral account request and the potential future project costs, FEI indicated that it would be amenable to holding a workshop to discuss the project scope and justification, and the potential impacts on the system and customers.

Accordingly, in April 2019, FEI hosted a workshop with interveners and BCUC staff. During the workshop, FEI and JANA jointly presented an overview of the TIMC project drivers and further described the Phase 1 CPCN development activities, including the collection of integrity data and the QRA process. At the conclusion of the workshop, FEI indicated that it intended to host a subsequent workshop in the fall of 2019 to provide the results of the Phase 1 QRA and the proposed scope of work for the project. This workshop was deferred until the spring of 2020 to allow additional time to complete the QRA; unfortunately, due to the COVID-19 pandemic, this workshop was ultimately cancelled. As discussed in section 1, FEI is proposing to have a

[64] Application for FEI Annual Review for 2019 Rates, p. 127, ll. 16-19.

workshop in this proceeding, in which FEI will be able to, amongst other things, present on the results of the QRA and the Project more generally.

5.3.2 Project Development Costs Were Necessary and Are Consistent with Original Forecasts

Table 12-1 from the Annual Review for 2019 Delivery Rates application (reproduced below), provided a forecast of development cost expenditures related to Phases 1 and 2:

Table 12-1: CPCN Development Costs ($000s)

Line No.	Phase	2018	2019	2020	Total
1	Phase 1	$ 5,680	$ 5,710	$ 230	$ 11,620
2	Phase 2	-	19,000	11,000	30,000
3					
4	Total	**$ 5,680**	**$ 24,710**	**$ 11,230**	**$ 41,620**

As FEI progressed with the Project development, the activities within each phase were further defined and consisted primarily of five categories:

1. The QRA needed to inform the Project, including priority and urgency (as described in Section 3.4.4);
2. Records and data refinement to provide the needed inputs for the QRA, and technical analysis and review of the QRA outputs;
3. A pilot project to test EMAT ILI tool behaviour in FEI pipelines (as described below in Section 5.3.3);
4. Scope development, FEED level engineering, and cost estimating required to define the Project to an appropriate level for this Application;
5. Application costs associated with the regulatory development and review of the submission to the BCUC.

Item 1 in the list above corresponds to the Phase 1 activities. Items 2 through 5 correspond to work associated with Phase 2.

As discussed in Section 6.2, the cost of these activities has been recorded in the approved TIMC Project Development deferral account. The costs are a combination of capital expenditures to be added to rate base, and one-time expenses supporting the development that FEI is proposing to amortize into rates over a three-year period. Further details for each item are provided in Table 5-3 below.

Table 5-3: Development Costs and Proposed Treatment

Item	Description	Phase	Proposed Treatment	Total Cost ($000s)
Initial QRA development	The costs for FEI's external consultant (JANA) to conduct a baseline system-level QRA. This work was required to meet previous commitments to the BCOGC to support the development of a segment-by-segment risk assessment process, as well as to confirm that SCC and cracking threats present a credible risk to FEI transmission pipelines.	Phase 1	Amortized expenses	10,552
QRA support costs	These are costs associated with collecting the necessary data (e.g., pipeline attributes, operating conditions, etc.) required as inputs for the QRA risk models. Additionally, this includes the internal and external costs associated with FEI's review and assessment of the QRA outputs. This was required to confirm the detailed scope and prioritization of work to be included in the CTS TIMC Project versus future TIMC projects.	Phase 2	Amortized expenses / Rate Base Capital	8,491
EMAT ILI Pilot Project	These costs are associated with retrofitting two pipelines in the FEI transmission system to accommodate running EMAT ILI tools. Also included are the costs of the tool runs themselves. Further information is provided in section 5.3.3 below.	Phase 2	Amortized expenses / Rate Base Capital	6,748
CTS TIMC Project Development	Costs associated with scope development, FEED level engineering, cost estimating, environmental investigations, and project management required to define the Project to an appropriate level for this Application. Also included are public consultation and Indigenous engagement costs.	Phase 2	Rate Base Capital	4,523
Application Costs	Costs associated with the preparation of the application, including external legal and regulatory reviews.	Phase 2	Amortized Expenses	510
			Total Costs	**30,824**

The total actual and projected development costs for the CTS TIMC project are $30.824 million to be incurred to the end of 2021, compared to the original estimated CPCN application development costs of $41.620 million for the entire TIMC project, as shown in Table 12-1 above. FEI notes, however, that the development costs for the future ITS TIMC CPCN application will continue to be collected in the deferral account until submission and a decision from the BCUC on that application. The costs for the ITS TIMC are expected to be substantially lower than those recorded to date, as the only items that will be incurred for this future application will be those associated with the scope development, FEED level engineering, cost estimating, environmental, project management, and consultation and engagement costs, shown in Table 5-3 above, as well as some incremental QRA refinement costs as it pertains to the ITS pipeline system.

5.3.3 FEI Conducted an EMAT ILI Pilot Project to Support Project Development

As part of its Project development activities, FEI identified two pipeline segments where the system readiness factors described in Section 5.2 were achievable within timelines practical to inform the development of the Project, allowing further refinement and certainty into the scope and requirements of the Project. As such, FEI proceeded with the required alterations and baseline EMAT inspection of these two pipeline segments to inform FEI's development of the Project. The costs associated with preparing these two pipeline segments for the tool run and running the tool were collected in the TIMC Development Cost deferral account, as described above in Section 5.3.2 and in Section 6.2. The two pipeline segments were:

1. LIV PAT 457
2. CPH BUR 508

These pipelines were selected for the pilot program for the following reasons:

- Both pipelines have experienced SCC which had been found when conducting routine pipeline exposure activities, unrelated to investigating SCC;
- Analysis of the behavior of geometry, MFL-A, and MFL-C tools indicated that the EMAT ILI tool would have no issues traveling through the pipelines, with only a minor likelihood of data loss; and
- The pipelines could be configured for flow control and to operate at a reduced pressure, with relatively minor upgrades.

Details of the alterations made to each of these pipelines are given below, followed by a description of how this pilot project informed Project development and planning.

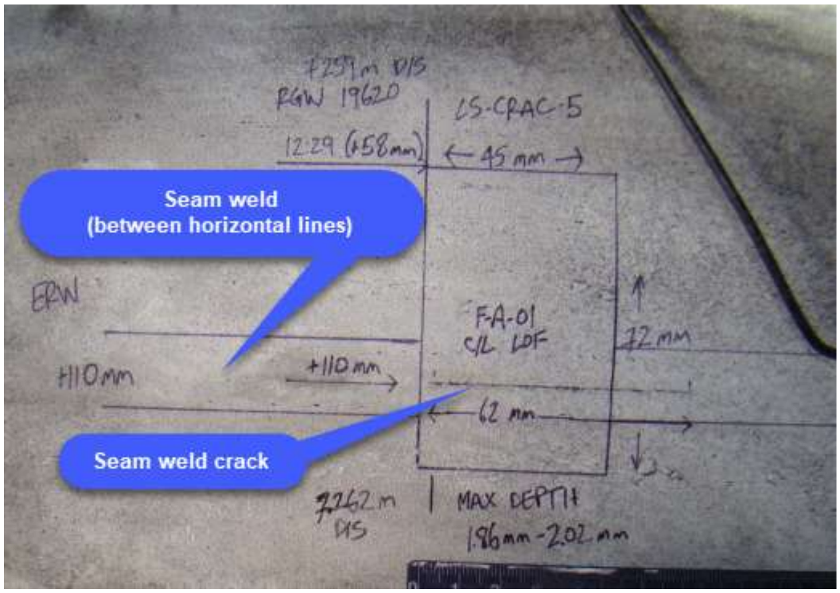
5.3.3.1 *LIV PAT 457*

In October 2019, FEI conducted a baseline inspection of the entire 29.8 km length of this pipeline, as shown in Figure 5-1 below. The Preliminary Report has been received, and while there was no severe cracking identified that warranted urgent repair work, the following features that had not been identified by FEI's current integrity management practices were reported:

- 5 crack features located in the seam weld
- 7 crack features located in the pipe, and
- 1 crack group

As a result, a subset of these features were selected, and ten initial data validation integrity digs were identified and are in progress: Five were completed in 2020 with the remainder scheduled in 2021. The features will be inspected, and a subset will be cut out and taken for further testing. Figure 5-1 shows a seam weld crack feature, 62mm in length, which was removed for further analysis and testing in 2020.

Figure 5-1: Seam Weld Crack Feature Identified by EMAT ILI on the LIVPAT457 Pipeline at Joint 19610

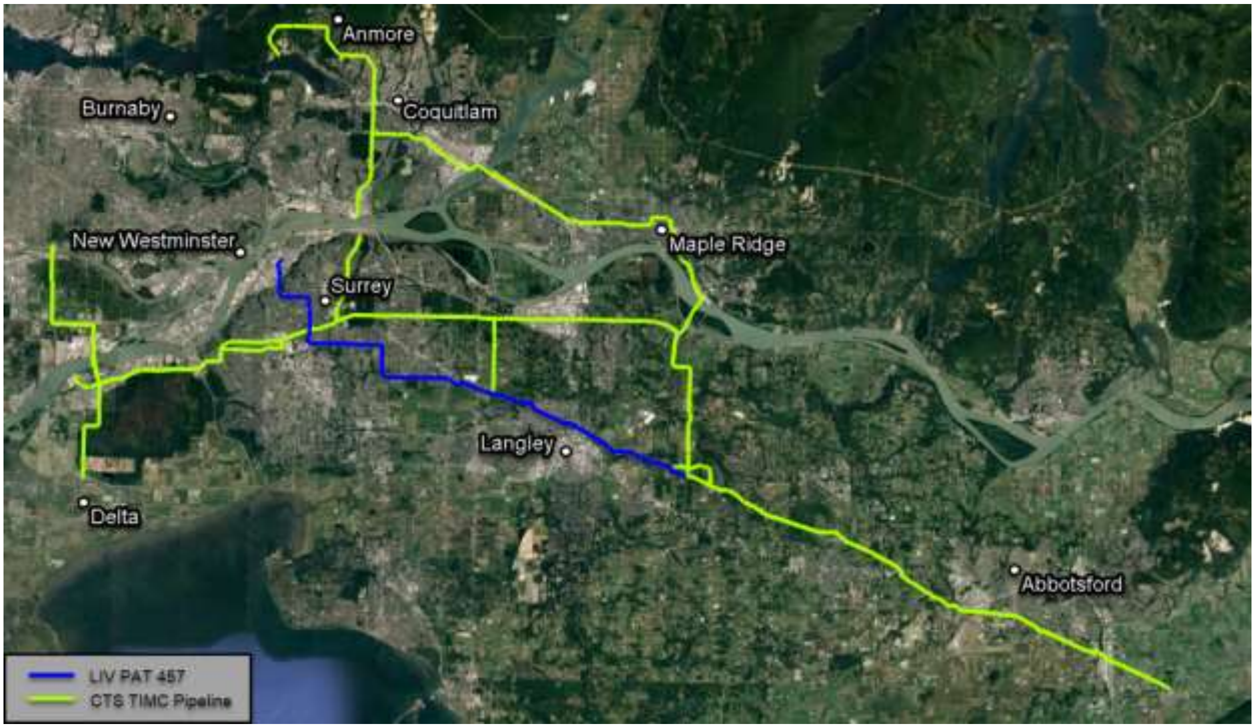


The following alterations were done to this pipeline to make it ready for EMAT run and to enable post EMAT inspection response:

- Modification to the launcher at Livingstone Regulating Station to allow launch of a longer EMAT ILI tool;
- Modification to the receiver at Pattullo Regulating Station to allow the retrieval of a longer EMAT ILI tool; and
- Installation of a PRS[65] at Livingstone Regulating Station (the upstream end) to allow pressure reduction, post EMAT run, if required.

[65] When a PRS is fabricated in a shop prior to transportation to site, it may be referred to as a "pressure regulating skid."

Figure 5-2: Overview Map of LIV PAT 457



5.3.3.2 *CPH BUR 508*

In September 2020, FEI performed a baseline inspection of a 4.4 km long segment of this pipeline between Coquitlam Gate Station and Noons Creek Valve Station (referred to as COQ NOO 508), as shown in Figure 5-3 below. While there was no severe cracking identified that warranted urgent repair work, the following features that had not been identified by FEI's current integrity management practices were identified, and five initial integrity digs are scheduled for 2021:

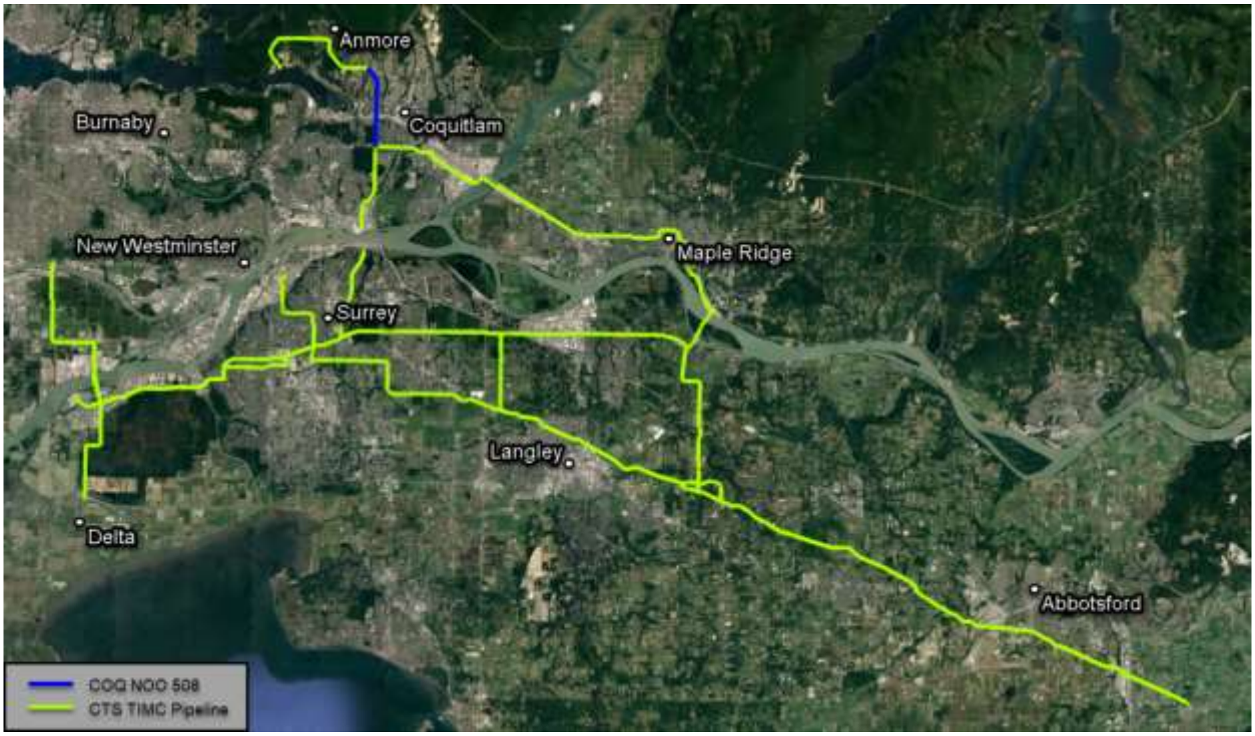
- 4 linear indications
- 1 crack group

The following alterations were performed to enable the ILI tool run and facilitate post run actions:

- Piping adjustments were made to the launching end at Coquitlam Gate Station to allow for the installation of a temporary launcher. The launcher used at this station was relocated from Noons Creek Valve Station where it is used to launch ILI tools into the second half of the CPH BUR 508 pipeline. The relocated launcher had to be modified before installation to allow launch of the longer EMAT ILI tool;
- Modification to the receiver at Noons Creek Valve Station to allow the retrieval of the longer EMAT ILI tool; and

- Installation of a PRS at Cape Horn Valve Station (the upstream end) to allow for pressure reduction, post EMAT run, if required.

Figure 5-3: Overview Map showing COQ NOO 508



5.3.3.3 *Pilot Project Informed Project Development and Planning*

In addition to providing an opportunity for earlier mitigation of the cracking threats for these two pipelines, this pilot project has informed FEI's CPCN development and planning. Preliminary results of the LIV PAT 457 provided FEI with valuable insight into the behaviour of the EMAT ILI tool performance and especially how it performed with respect to the MFL-A and MFL-C tools.

In general, the EMAT ILI tool run confirmed that in a majority of cases, the same features were causing speed excursions in MFL-C and EMAT ILI tools which enabled FEI to assess MFL-C tool data for pipelines where EMAT ILI data was not available. The EMAT ILI data collected during the pilot run also confirmed that EMAT ILI tools with speed control return back to their optimal velocity range quickly as compared to MFL-C tools. This information allowed FEI to conservatively refine the scope of the remainder of the pipelines within the scope of the CTS TIMC Project and defer removal or alteration of pipeline components with a minor or moderate affect on the speed until after the baseline EMAT ILI runs. This resulted in a reduced Project scope, and therefore a reduced Project cost.

5.4 PIPELINE ALTERATIONS REQUIRED FOR EMAT ILI TOOL RUNS

In this section, FEI describes the scope of alterations required to ready the pipelines for successful EMAT ILI runs. This section is organized as follows:

- Section 5.4.1 identifies the pipelines that are part of CTS TIMC Project scope and provides an overview of the modifications required; and
- Section 5.4.2 provides the details of the scope of alteration required to ready the pipelines for successful ILI runs. This section is further split into three sub-sections with each section describing a specific type of feature that will require modification.

5.4.1 FEI Assessed the CTS Pipelines to Determine the Need for Alterations

As part of Project development, FEI's assessment of the 11 CTS transmission pressure pipelines determined that modifications are required to run EMAT ILI tools. A list of the pipelines and scope of alterations is summarized in the table below.

Table 5-4: Pipelines Part of Project Scope

Pipeline	Length (km)	Number of alterations	Summary of alterations
HUN ROE 1067	55.7	1	Replacement of heavy wall valve assembly
HUN NIC 762	56.4	2	Replacement of heavy wall valve assemblies
LIV COQ 323	34.9	1	Replacement of heavy wall crossing pipe
CPH BUR 508	17	5	Replacement of heavy wall valve assembly, station pipe, crossing pipe and forged elbow
TIL FRA 508	9.6	2	Replacement of heavy wall valve assembly, station pipe and crossing pipe
TIL BEN 323	5.9	2	Replacement of heavy wall forged elbows
LIV PAT 457	29.8	None	Not applicable
NIC FRA 610	24.3	None	Not applicable
ROE TIL 914	12.8	None	Not applicable
NIC PMA 610	4.9	None	Not applicable
TIL LNG 323	1.7	None	Not applicable

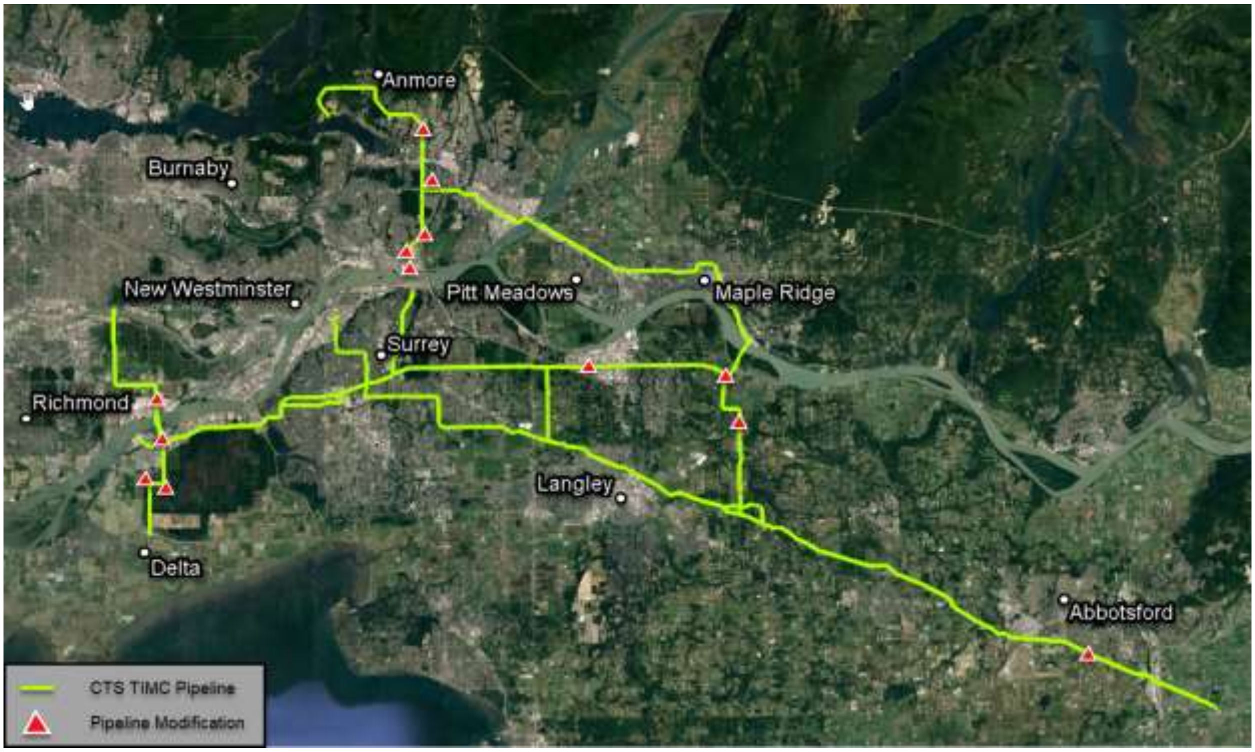
As noted above and further discussed in Section 5.4.2 below, pipeline alterations are required to replace 13 heavy wall segments on six pipelines to ensure that the ILI tool can travel within its optimal velocity range, which is critical for the collection of full resolution ILI data.

5.4.2 Heavy Wall Segment Replacements Are Required to Reduce Speed Excursions

There are a total of 13 segments on six pipelines where alterations are required to replace heavy wall portions of pipe to reduce speed excursions. FEI identified the locations based on a detailed review of historical ILI reports, as-built information, discussions with ILI vendors regarding the pipelines identified in Table 5-4, and learnings from the pilot EMAT ILI runs (as further explained in Section 5.3.3).

Figure 5-4 shows the locations where these heavy wall segment replacements are required.

Figure 5-4: Project Overview Map Showing Pipeline Alteration Locations



ILI tools are sensitive to speed as speed affects their capability to collect quality data. EMAT ILI tools are more sensitive to speeds than the ILI tools currently in use by FEI. For example, the maximum velocity beyond which data quality is compromised for EMAT tools is 2m/s while its 5m/s for the MFL tools.

One phenomenon that affects the tools' data collection capabilities is known as "speed excursion". Speed excursions are localized increases in tool velocity where the tool travels beyond the maximum allowable velocity at which it can collect quality data. The effect of speed excursion ranges from degradation of data quality to a complete inability for the tool to collect data, resulting in blind spots.

Analysis of ILI velocity data from previous inspection runs, coupled with a review of EMAT ILI tool specifications and discussions with ILI tool vendors, revealed that speed excursions frequently happen downstream of heavy-wall portions of pipe. Heavy-wall pipe can be found along a segment of pipe for a variety of reasons or it can be associated with tight-radius forged fittings such as elbows or tees.

In order to reduce speed excursions in ILI tools as much as practicably possible, the Project will replace heavy-wall pipe where heavy wall pipe is known to have caused speed excursions in the past when undertaking ILI runs. The replacement pipe will match the wall thickness of adjacent line pipe. This will ensure that the tools do not encounter the transition in pipe wall thickness during inspection and therefore avoid speed excursions.

The Project will replace 13 segments of pipe along the six pipelines. These segments of pipe can be categorized into the following three categories:

1. Heavy-wall Forged Elbows
2. Heavy-wall Crossings Pipe
3. Heavy-wall Stations Pipe

These three categories are further detailed in the three sections below.

5.4.2.1 *Heavy-Wall Forged Elbows*

Three locations have been identified along the pipelines in Table 5-5 where tight radius, heavy-wall forged elbows are known to have caused speed excursions. These elbows were installed in the 1950s and 1960s when these pipelines were originally built and will be replaced with long-radius induction bends such that the wall thickness of the induction bend matches the wall thickness of the adjacent line pipe, eliminating the source of speed excursion. A summary of the three locations requiring bend replacement is provided below.

Table 5-5: Bend Modification Scope

Pipeline	Event ID	Location	Installation Technique
TIL BEN 323	3	Burns Bog; City of Delta	Open-cut
TIL BEN 323	5	Burns Bog; City of Delta	Open-cut
CPH BUR 508	9	Cape Horn Avenue; City of Coquitlam	Open-cut

Further details can be found in the Pipelines Design Basis Memorandum (M-0002-PIP-DBM-0001) provided in Appendix D-2 as part of the Final FEED Report (M-0002-PMT-REP-0021).

5.4.2.2 *Heavy-Wall Crossing Pipe*

Four locations have been identified where heavy-wall pipe was used to cross roads or other utilities that are associated with speed excursions. These heavy-wall pipe segments were either installed as part of original installation in the 1950s or installed in the 1980s when the infrastructure around the pipeline was upgraded. All such heavy-wall crossing pipe will be replaced with line pipe that matches the wall thickness of the adjacent pipe. A summary of the four locations requiring crossing pipe replacement is provided below:

Table 5-6: Crossing Pipe Modification Scope

Pipeline	Event ID	Location	Installation Technique
CPH BUR 508	4/5	Lougheed Highway; City of Coquitlam	Trenchless
CPH BUR 508	20	David Avenue; City of Coquitlam	Trenchless or Open-cut
LIV COQ 323	9	TransMountain Pipeline; Township of Langley	Open-cut
TIL FRA 508	1	River Road; City of Delta	Trenchless or Open-cut

Further details can be found in the Pipelines Design Basis Memorandum (M-0002-PIP-DBM-0001) provided in Appendix D-2 as part of the Final FEED Report (M-0002-PMT-REP-0021).

5.4.2.3 *Heavy-Wall Station Pipe*

Eight locations have been identified where heavy-wall pipe within a station boundary has caused speed excursions in the past. These segments of heavy-wall pipe are either downstream of pig-barrel isolation valves or are part of a heavy-wall valve assembly. All heavy-wall segments of pipe will be replaced with line pipe that matches the wall thickness of the adjacent pipe and will meet applicable code requirements. In order to minimize speed excursions as much as possible, replaced valves and fittings will be selected with an internal diameter that matches the internal diameter of the adjacent line pipe. A summary of the eight station locations requiring heavy-wall pipe replacement is provided below.

Table 5-7: Station Pipe Modification Scope

Pipeline	Event ID	Facility	Type
CPH BUR 508	1	Cape Horn Valve Station; City of Coquitlam	Pipe segment
CPH BUR 508	14	Coquitlam Gate Station; City of Coquitlam	Valve assembly
CPH BUR 508	20	Westwood Regulating Station; City of Coquitlam	Valve assembly
HUN NIC 762	36	Fort Langley Valve Station; Township of Langley	Valve assembly
HUN NIC 762	41	Latimer Gate Station; City of Surrey	Valve assembly
HUN ROE 1067	12	King Road Valve Site; City of Abbotsford	Valve assembly
TIL FRA 508	1	Tilbury Regulating Station; City of Delta	Pipe segment
TIL FRA 508	6	Nelson Gate Station; City of Richmond	Valve assembly

Further details can be found in the Pipelines Design Basis Memorandum (M-0002-PIP-DBM-0001) provided in Appendix D-2 as part of the Final FEED Report (M-0002-PMT-REP-0021). The Final FEED Report also provides an overview map showing the location of these modifications.

5.5 FACILITY ALTERATIONS REQUIRED FOR EMAT ILI TOOL RUNS

In this section, FEI describes the scope of alterations required to CTS facilities to enable successful EMAT ILI runs. This section is organized as follows:

- Section 5.5.1 identifies the facilities that are part of CTS TIMC Project scope and provides an overview of the alterations required; and
- Sections 5.5.2 to 5.5.5 provide the details of the scope of alterations required to ready the facilities for successful EMAT ILI runs.

5.5.1 FEI Assessed the CTS Transmission Facilities to Determine the Need for Alterations

As part of Project development, FEI assessed the 17 transmission pressure facilities associated with the 11 CTS pipelines within the scope of the Project to determine the scope of alterations required to make the system ready for the introduction of EMAT ILI tools. A list of the facilities that were evaluated to determine the scope of facility alterations along with a summary of alterations required is set out in the table below.

Table 5-8: Facilities Part of Project Scope

Facilities	Associated Pipelines	Scope of Modifications
Huntingdon Control Station	HUN ROE 1067 HUN NIC 762	Modification to pig barrels, station piping and upgrades to pressure regulating capability
Livingstone Regulating Station	LIV PAT 457 LIV COQ 323	Modification to pig barrel, station piping and equipment
Nichol Valve Station	HUN NIC 762 NIC PMA 610 NIC FRA 610	Modification to pig barrels, station piping and addition of pressure and flow regulating capability, including backflow prevention
Roebuck Valve Station	LIV PAT 457 ROE TIL 914	Modification to pig barrels, station piping and addition of pressure regulating capability
Port Mann Valve Station	NIC PMA 610	Modification to pig barrel, station piping and addition of flow control capability
Tilbury Regulating Station	TIL FRA 508 TIL LNG 168 TIL BEN 323 ROE TIL 914	Modification to pig barrels, station piping and addition of flow control capability
Tilbury LNG Plant Station	TIL LNG 168	Modifications to pig barrel and station piping
Benson Regulating Station	TIL BEN 323	Modification to pig barrel and station piping
Fraser Gate Station	TIL FRA 508 NIC FRA 610	Modification to pig barrels, station piping and addition of flow control capability

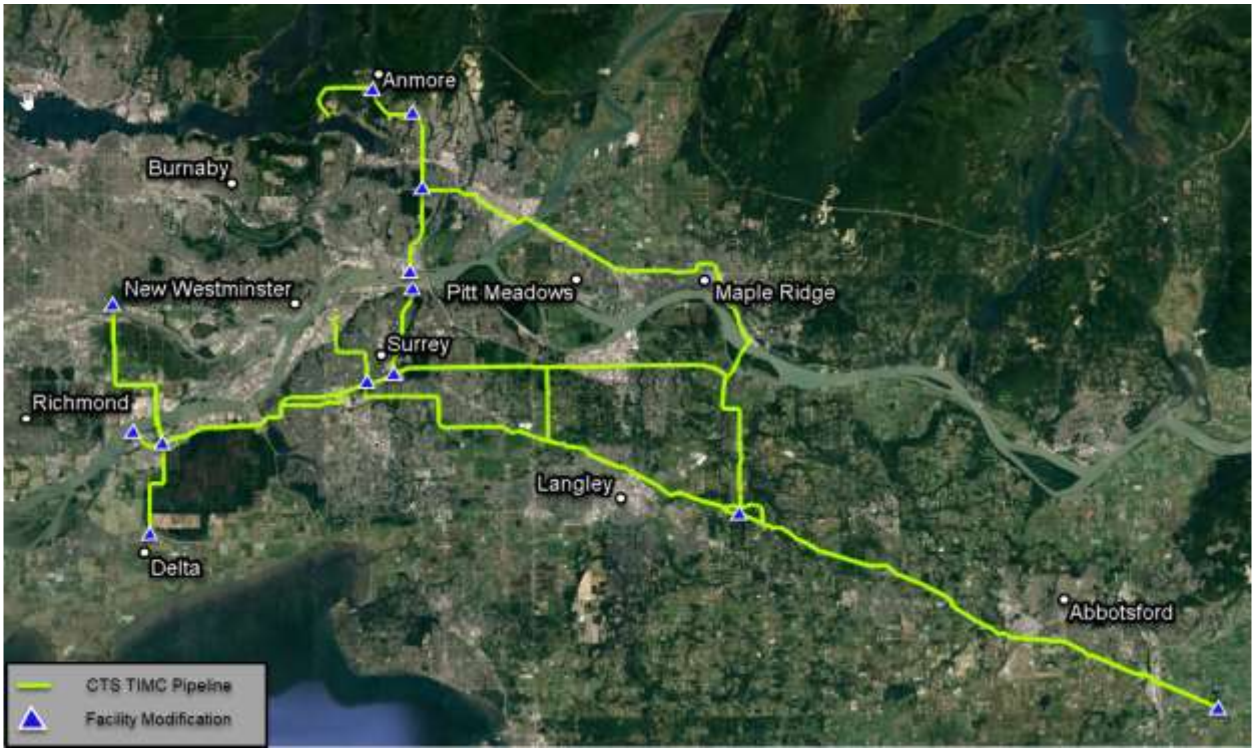
Facilities	Associated Pipelines	Scope of Modifications
Cape Horn Valve Station	CPH BUR 508	Modification to pig barrel and station piping
Coquitlam Gate Station	CPH BUR 508 LIV COQ 323	Modification to pig barrels, station piping and addition of pressure regulating capability
Noons Creek Valve Station	CPH BUR 508	Modification to station piping and addition of pressure regulating capability
Anmore Regulating Station	CPH BUR 508	Upgrades to pressure regulating capability
Pattullo Regulating Station	LIV PAT 457	None required
Burrard Thermal Regulating Station	CPH BUR 508	None required
Belcara Regulating Station	CPH BUR 508	None required
Ioco Regulating Station	CPH BUR 508	None required

As noted in the table above, 13 facilities were identified as requiring modifications to enable FEI to ready the system for introduction of EMAT ILI tools while ensuring that full resolution data is collected during inspections. These modifications can be categorized into the following four categories:

1. Pig barrel modifications;
2. Installation of flow control capability;
3. Installation of pressure regulation capability; and
4. Installation of backflow prevention capability.

Sections 5.5.2 to 5.5.5 describe the proposed facilities modifications and Figure 5-4 below shows the locations where these modifications will take place. Refer to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2 for further details on the analysis performed to determine the scope of work required to enhance FEI's integrity management capabilities.

Figure 5-5: Project Overview Map Showing Facilities Alteration Locations



5.5.2 Pig Barrel Modifications Are Required to Accommodate EMAT ILI Tools

Launching and receiving barrels, also referred to as “launchers” and “receivers”, respectively (and collectively as “pig barrels”), are required to facilitate the insertion and retrieval of ILI tools into a pipeline. All eleven pipelines in the Project’s scope already have pig barrels installed that have been used in the past for in-line inspections. However, these pig barrels are not capable of accommodating EMAT ILI tools because EMAT ILI tools are longer than the ILI tools that FEI currently uses.

In order to ensure that FEI can launch and retrieve EMAT ILI tools, the pig barrels on the Project’s pipelines were analysed for compliance with EMAT ILI tool specifications and necessary modifications were proposed. A summary of these modifications is provided below:

1. Extend the nominal and/or oversize portions of the launchers to ensure that the ILI tool is fully within the barrel to allow for the barrel door to be shut closed before launch;
2. Extend the nominal and/or oversize portions of the receivers to ensure that the ILI tool has completely cleared the barrel isolation valve to allow for ILI tool retrieval;
3. Install pull-in mechanisms in the launchers that will allow the insertion of these tools far enough into the pig barrel to enable launch; and

4. Install new concrete supports under the extended portions of the pig barrels along with the installation of new and longer pigging slabs that will facilitate the ILI tool launch trays to be positioned in place for launch and receipt.

Following a review of 22 pig barrels installed on the Project pipelines, FEI determined that 18 pig barrels will require modification to meet the requirements described above. The pig barrels requiring modification are spread across eleven facilities.

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for site-specific pig-barrel modification details and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.5.3 Gas Flow Control Is Required to Manage Tool Velocity

As described in Section 5.2 and Section 5.4.2, high travel velocities negatively affect the quality of data collected by ILI tools, and the removal of heavy wall pipe will minimize speed excursions. Another significant contributor to speed excursions are high gas flowrates within the existing pipelines, which cannot be addressed through the removal of heavy wall segments of pipe.

To ensure that the ILI tools are traveling as close as possible to their optimum travel velocity, a Flow Control Station (FCS) will be installed on the downstream end of the pipeline in order to control the gas flowrate in the pipeline subjected to EMAT inspection. Control over gas flowrate will enable FEI to control the velocity of tools without a velocity control mechanism, as these tools rely on gas flow for propulsion.

In designing the FCS, FEI took into consideration the specifications of EMAT ILI tools currently available on the market, and more specifically these tools' capability of controlling travel velocity. For EMAT ILI tools that come with built-in speed control, enabling them to manage their travel velocity, FEI found that such tools perform better when they are subjected to higher gas flowrates. Since current flowrates in the Project's pipelines allow for higher tool travel velocity, it was determined that a FCS will not be required for situations when an ILI tool with built-in speed control is utilized. However, there are EMAT ILI tools provided by certain vendors that do not come with built-in speed control which will require a FCS. Since the EMAT ILI tools that do not have built-in speed control are limited to NPS24, NPS30 and NPS36, the FCS will be used for these pipeline sizes only. A summary of the various aspects of the FCS is provided below:

1. The FCS works on the principle of pressure differential, in which a fluid moves from a region of higher pressure to a region of lower pressure. This means that the FCS will be installed at the downstream end of the pipeline where flowrate control is required. This installation orientation will enable the movement of gas, in a controlled manner, from the pipeline at higher pressure to an adjacent pipeline that is operating at a lower pressure;

2. A single FCS will be fabricated that will come equipped with a NPS8 control valve for flowrate control and an ultrasonic flowmeter for flowrate monitoring. The selection of the NPS8 control valve will enable the FCS to be used for NPS24, NPS30 and NPS36 pipelines when EMAT ILI tools with no speed control are utilized;
3. The FCS has been designed to be a fully independent unit that will be temporarily installed at the downstream end of the pipeline undergoing an in-line inspection with an EMAT tool with no speed control; and
4. Piping and foundation for the FCS will be installed at select station facilities on a permanent basis, allowing the FCS to be connected when required.

Four facilities will require permanent piping and foundations in order to accommodate temporary FCS installation for flow control during ILI inspections. These facilities include:

1. Nichol Valve Station;
2. Port Mann Valve Station;
3. Tilbury Regulating Station; and
4. Fraser Gate Station.

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for further details on the FCS and site-specific details on modifications required for connecting the FCS to existing infrastructure and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.5.4 Pressure Regulation Is Required to Support EMAT ILI Activities

FEI's existing transmission pressure (TP) pipeline network across the Lower Mainland is supplied solely from the Huntingdon Control Station. This station is located in Abbotsford where high pressure gas supply is subjected to a pressure reduction prior to being directed into the CTS. The CTS supplies gas across the Lower Mainland, as well as connecting gas supply to Vancouver Island via the V1 Compressor Station.

Once the EMAT ILI tool has completed its run, with the exception of the HUN ROE 1067 transmission pipeline, it is not known how many features will be found, and as such, it may not be possible to complete all repairs in the same calendar year. Should this be the case, the integrity risk of having unrepaired features on those pipelines can be mitigated by a 20 percent reduction in operating pressure until all repairs are complete.

Currently, Huntingdon Control Station is the sole location where operating pressure can be reduced in the 11 pipelines identified in this Project's scope. If a pressure reduction is required on a TP pipeline within the CTS, regardless of the reason, outlet pressure at Huntingdon Control Station must be reduced. As Huntingdon Control Station is the sole source of supply to the CTS, reducing the outlet pressure reduces the pressure in the entire system and would cause disruption in the overall gas supply during winter months (when demand is historically highest). The uncertainty around the number of repairs and their timelines that will be initiated from the EMAT ILI runs requires a greater level of operational and maintenance flexibility. As such, FEI has determined that pressure control capabilities need to be added at strategic locations across the CTS.

Pressure regulation will be achieved across the system through the following means:

1. Re-purposing of existing pressure regulation capabilities at Huntingdon Control Station to enable 20 percent reduction in operating pressure;
2. Installation of new PRS enabling 20 percent reduction in operating pressure; and
3. Installation of new PRS at Noons Creek Valve Station to reduce operating pressure such that resultant hoop stress in pipeline remain under 30 percent SMYS.

These means of achieving pressure regulation reflect the complex and dynamic nature of the CTS, the need to prioritize modifications of existing facilities in response to space constraints and capital efficiencies.

Each of the three means of achieving pressure regulation are described further in the sections that follow.

5.5.4.1 *Re-purposing Existing Pressure Reduction Capabilities at Huntingdon Control Station to enable 20 percent Reduction in Operating Pressure*

Two of the 11 pipelines included in the Project scope originate at Huntingdon Control Station (i.e., HUN ROE 1067 (NPS42) and HUN NIC 762 (NPS30)). As described above, Huntingdon Control Station is the source of all natural gas delivered to the CTS (Lower Mainland), Sunshine Coast and Vancouver Island. The NPS42 pipeline originating at this station is the backbone of the CTS. A 20 percent reduction to the operating pressure of the NPS42 pipeline for extended periods, especially during the winter months, will disrupt gas supply to the CTS. However, when at full operating pressure, the NPS42 pipeline can support the CTS for extended periods during peak periods of the winter months if the NPS30 is operated at a reduced operating pressure.

Huntingdon Control Station contains two pressure regulating stations known as Station 1 and Station 2 that are each designed to meet system requirements with the second station acting as a backup. This facility also includes a bypass regulating line that takes its supply upstream of the two stations and is engaged if both stations are not available. Put another way, the bypass regulating line acts as a bypass around the Huntingdon Control Station.

The outlets of each pressure regulating station at Huntingdon Control Station merge into a single line before feeding the two pipelines leaving the facility and therefore operate at the same pressure. Rather than adding a new PRS to the NPS30 pipeline, FEI decided to split the outlet line so that one of the two pressure regulating stations can be dedicated to one pipeline at a time (as required) while the bypass acts as a redundant path. This setup requires the bypass line to be upgraded with bigger control valves and the addition of a fourth regulating run to Station 1.

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for further details on modification to Huntingdon Control Station and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.5.4.2 *Installation of New PRS for 20 percent Reduction in Operating Pressure*

New PRSs have been designed for installation at four (4) facilities across the CTS in order to expand FEI's operational and maintenance capabilities. The four facilities that will require a PRS to meet the project objectives are:

1. Nichol Valve Station;
2. Roebuck Valve Station;
3. Livingstone Regulating Station[66]; and
4. Coquitlam Gate Station

Key features of the PRS are provided below:

1. The PRS will be permanently installed at the upstream end of a pipeline allowing the downstream pressure to be reduced by 20 percent of the operating pressure (when required);
2. Design and sizing of the PRS will be aligned to allow the same design to be used at multiple sites providing ease of fabrication, operation, maintenance and reduced project costs;
3. The PRS has been designed with two fully redundant flow paths where each path contains its own set of control valves and isolation valves enabling uninterrupted operation in case one flow path fails to perform; and
4. Due to the dense urban location of the facilities that will receive the PRS, the design uses special control valves with noise abatement that operate more quietly when compared to normal control valves. In addition to the use of special control valves, sound attenuating enclosures will be utilized to further minimize noise emanating from control valve operation.

[66] This PRS was installed to support the pilot EMAT-ILI run and is currently in service. Refer to Section 5.3.3 for further details.

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for further details on PRS and site-specific details on required modifications to existing infrastructure and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.5.4.3 *Installation of New PRS at Noons Creek Valve Station to Reduce Operating Pressure such that resultant hoop stress in pipeline remain under 30 percent SMYS*

As described above, traditional ILI tools rely on gas flow, which is dependent on gas demand, for propulsion. Of the eleven (11) pipelines identified in the Project's scope, the issue of inadequate gas flow arises in the second half of the CPH BUR 508 (NPS20) pipeline. The demand in this section of the NPS20 pipeline is too low to generate enough flow to take the ILI tool along.

In light of the discussion in Section 4.7, FEI is proposing to permanently reduce the pressure in the second half of the pipeline from transmission pressure to intermediate pressure. This pressure reduction will result in an operating pressure producing a hoop stress lower than 30% SMYS. This will be accomplished by adding a PRS at Noons Creek Valve Station in Port Moody that will get its intake from the first half of the NPS20 pipeline and reduce the pressure before feeding it to the downstream half of the NPS20 pipeline. A heater will also be added to heat the gas in order to maintain the same gas volume resulting from the significant pressure drop which will precipitate a corresponding temperature drop.

Given the small footprint of the Noons Creek Valve Station and to avoid expanding this footprint, the above ground piping that facilitated launch of ILI tools in the second half of the NPS20 pipeline will be demolished to make room for installation of the PRS and the heater. A noise reducing enclosure will be added at Noons Creek Valve Station to ensure that the noise levels are not greater than what was before the installation of the PRS.

The second half of the CPH BUR 508 pipeline (i.e., NOO BUR 508) supplies natural gas via laterals to three distribution pressure networks, supplying the communities of Anmore and Belcarra and an industrial customer at the downstream end. FEI evaluated the above pressure regulating stations (or gate station) installed at each of the lateral offtakes identified and it was determined that only Anmore Regulating Station required an upgrade in order to continue operation once the NOO BUR 508 pipeline is derated. A map showing this particular pipeline segment is given below:

Figure 5-6: Overview map of NOO BUR 508 w.r.t CTS TIMC Project pipelines

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for further details on PRS and site-specific details on required modifications to existing infrastructure and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.5.5 Backflow Prevention is Required to Support EMAT ILI Activities

To prevent backflow from the Nichol Valve Station into the NPS30 pipeline, instrumentation and controls at this station will be upgraded so that appropriate valves can automatically close when pressure in the NPS30 falls below system pressure.

Many of the transmission pressure pipelines spread across Lower Mainland are connected to each other. While this interconnectedness provides many advantages, it also presents challenges in the form of gas backflow. Gas backflow into a pipeline occurs when the pipeline is operating at a lower operating pressure following an ILI inspection while the rest of the network is operating at a higher operating pressure.

Operationally, this challenge will be encountered on the HUN NIC 762 (NPS30) pipeline where the gas can backflow into this pipeline from Nichol Valve Station. Nichol Valve Station, under normal operating conditions, is fed by the HUN NIC 762 (NPS30) and HUN ROE 1067 (NPS42) pipelines at full operating pressure. Unless backflow prevention is in place at Nichol Valve Station, there is a possibility that gas at higher pressure from the Nichol Valve Station could backflow into the NPS30 pipeline when the NPS30 pipeline is being operated at 20 percent below its normal operating pressure following an ILI inspection. In order to avoid this situation, instrumentation and controls at this station will be upgraded so that appropriate valves can automatically close when pressure in the NPS30 falls below system pressure.

Refer to the Facilities Scope of Work (M-0002-ENG-SOW-0001) for further details on backflow prevention and Facilities Design Basis Memorandum (M-0002-MEC-DBM-0001) for design details. Both documents are appended to the Final FEED Report (M-0002-PMT-REP-0021) provided in Appendix D-2.

5.6 *PROJECT SCHEDULE*

The preliminary Project schedule is based on receiving BCUC Project Approvals by Q1 2022 and an assumed construction start of Q1 2024. The schedule considers performance of the site work between the months of April and October 2022. Until BCUC Approval is received, FEI plans to utilize this time to complete all permitting and consultation activities. FEI, in conjunction with the Project FEED engineering consultant (Stantec), developed the Project construction schedule. The Basis of schedule can be found in Appendix D-3.

The Project activities will be subdivided into six main groups as follows:

1. Project Services;
2. Permitting;
3. Engineering detailed design;
4. Contract Award / Procurement / manufacturing;
5. Pipeline Construction; and
6. Facilities Construction.

Table 5-9: Project Schedule

Activity	Date
CPCN Preparation	Jun 2020 to Jan 2021
CPCN Filing	Feb 2021
CPCN Approval	Q1 2022
Contractor Selection and Award	
Engineering Services Contractor Selection and Contractor Negotiation	Sep 2021 to Dec 2021
Construction Contractor Selection and Contract Negotiation	Apr 2023 to Aug 2023
Permitting for CTS TIMC	
Municipal and Community Consultation	Nov 2020 to Nov 2024
Indigenous Communities Consultation	Nov 2020 to Dec 2023
OGC Permits	Jul 2022 to Jan 2024
ALC Permits	Jun 2022 to Jan 2024

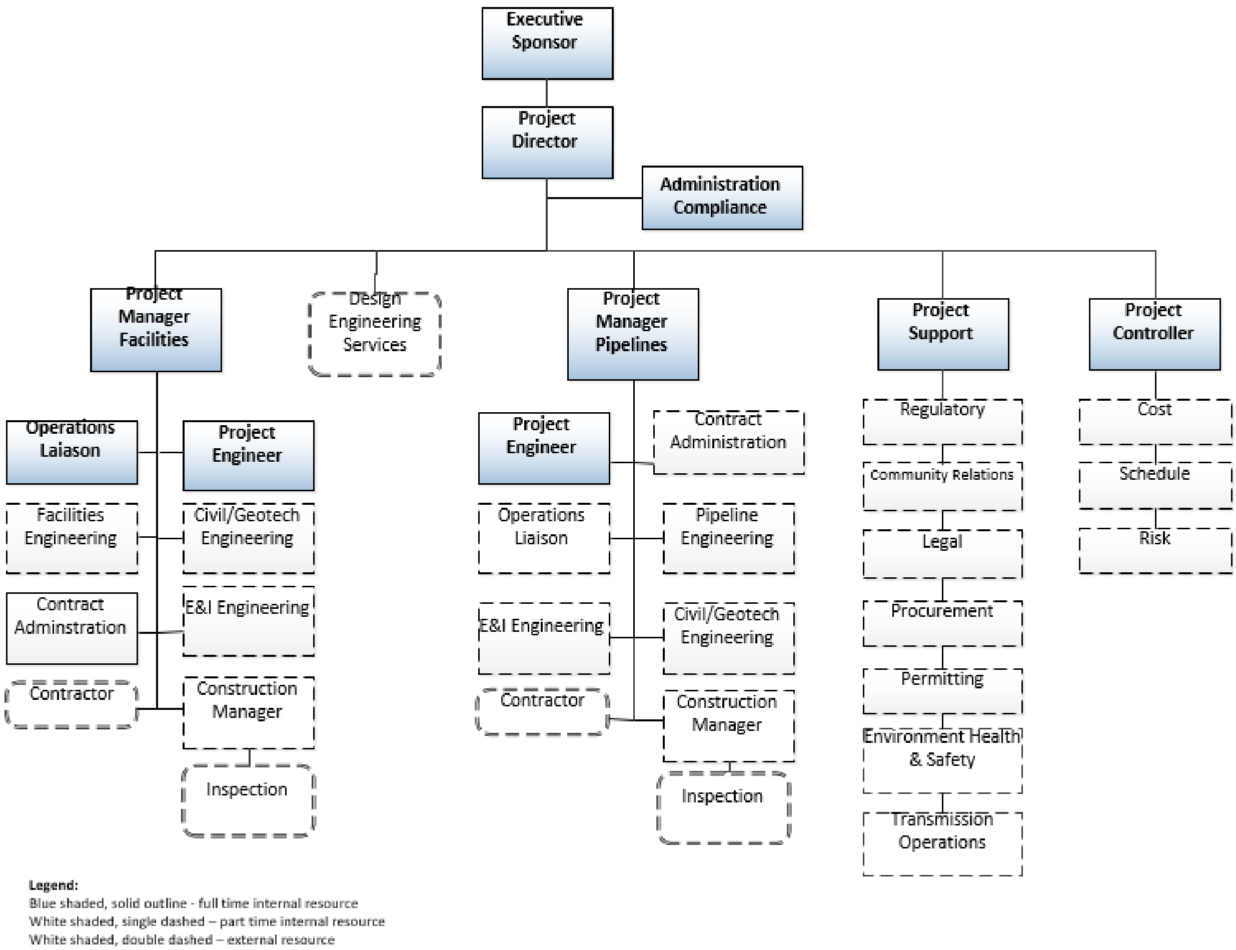
Activity	Date
Federal Permits (Vancouver Fraser Port Authority, Transport Canada, Department of Fisheries and Oceans)	Jun 2022 to Jan 2024
Railway Crossing Permits	Jun 2022 to Jan 2024
Ministry of Transportation and Infrastructure Permits	Jun 2022 to Jan 2024
Municipal and Regional District Permits	Jun 2022 to Jan 2024
Utility Permits & Approvals	Jun 2022 to Jan 2024
Environmental and Archaeological Permits	Jul 2022 to Jan 2024
CTS TIMC CONSTRUCTION	
Land Owner consultation	Apr 2023 to Aug 2023
Secure Detail Design Engineering Consultant	Feb 2022
Engineering Detailed Design	Mar 2022 to Jan 2023
Procurement and Manufacturing	
Long Lead Items	Jun 2022 to Mar 2023
Facilities, Electrical, and Instrumentation	Mar 2023 to Aug 2023
Fabrication	Oct 2023 to Jul 2024
Mobilization to Site	Feb 2024
Site Installation	
Construction	Mar 2024 to Nov 2024
Restoration and Demobilization	Mar 2024 to May 2025
Project Close Out	Dec 2024 to Nov 2025

A more detailed schedule is included as Appendix F.

5.7 PROJECT RESOURCES

Figure 5-7 outlines a functional organization chart for the execution of the Project. The CTS TIMC 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. The Executive Sponsor for the execution of the Project is the Vice President, Major Projects.

Figure 5-7: Proposed Resource and Organization Chart for CTS TIMC Execution



5.8 *CONSTRUCTION MANAGEMENT*

Construction activities on the Project will be spread across the Lower Mainland in ten municipalities. Worksites will range from agricultural fields to densely populated urban neighbourhoods, with each worksite presenting its own set of challenges for construction. All work will be performed within the existing pipeline ROW and the station footprints. Only four work sites will require temporary workspace where navigating the existing infrastructure is unachievable and where the existing ROW cannot provide enough room to carry out construction activities safely and effectively. Temporary workspaces are as shown in Tables 5-10 and 5-11.

The sections below provide an overview of the construction execution plan. Further details can be found in the Construction Execution Plan (M-0002-PMT-PLN-0002) provided in Appendix D-2, as part of the Final FEED Report (M-0002-PMT-REP-0021).

5.8.1 Site Setup

All worksites including temporary construction workspaces will be secured by construction fencing to restrict public access. These fences will stay up until all construction activities at the site have finished or pose no hazard to the public. Where required, traffic management plans will be prepared in consultation with local municipalities to assist in maintaining traffic flow.

5.8.2 Safety and Security

Construction site safety and security will be maintained during the course of construction including all working and non-working hours (inclusive of weekends). A comprehensive safety plan will be developed by the construction contractor in compliance with FEI standards, WorkSafeBC regulations and the requirements of other stakeholders impacted by the Project, including municipalities.

5.8.3 Land Acquisition

The Project will require fee-simple temporary construction working space and access rights. FEI will develop a land management plan to assess the required properties and prioritize the access agreements based on risk and impacts to the Project schedule. In order to reduce the potential uncertainty associated with securing ROW Access Rights, FEI will notify the affected landowners beginning in April 2023 based on the land management plan. Upon granting of the CPCN, FEI will complete the confirmation of temporary workspace acquisition and ROW access rights with all affected landowners. The following tables identify land requirements for the pipeline and facilities scope to aid construction activities.

Table 5-10: Temporary Workspace Requirements for Pipeline Scope

Pipeline	Event ID	City	Dimension (approx.)	Ownership
TIL BEN 323	3	Delta	25m x 55m	Right of way and private
TIL BEN 323	5	Delta	25m x 25m	Right of way and private
TIL FRA 508	1	Delta	15m x 75m	Right of way
TIL FRA 508	6	Delta	10m x 40m	Private
CPH BUR 508	1	Coquitlam	5m x 40m	Right of way
CPH BUR 508	4/5	Coquitlam	150m x 150m	Right of way and private
CPH BUR 508	9	Coquitlam	18m x 30m	Right of way
CPH BUR 508	14	Coquitlam	20m x 85m	Right of way
CPH BUR 508	20	Coquitlam	50m x 50m	Right of way
LIV COQ 323	9	Langley	20m x 125m	Right of way and private
HUN NIC 762	36	Langley	25m x 20m; 15m x 25m	Right of way and private
HUN NIC 762	41	Surrey	12m x 30m	Right of way
HUN ROE 1067	12	Abbotsford	20m x 18m	Right of way

Table 5-11: Temporary Workspace Requirements for Facilities Scope

Facility	Workspace Requirements	Ownership
Huntingdon Control Station	Not required	N/A
Livingstone Regulating Station	Not required	N/A
Nichol Valve Station	20m x 50m	Right of way and municipal
Roebuck Valve Station	Not required	N/A
Port Mann Valve Station	40m x 10m and 50m x 7m	Right of way and municipal
Tilbury Regulating Station	Not required	N/A
Tilbury LNG Plant Station	Not required	N/A
Benson Regulating Station	Not required	N/A
Cape Horn Valve Station	20m x 5m	Right of way
Coquitlam Gate Station	20m x 6m and 25m x 10m	Right of way and municipal
Fraser Gate Station	Not required	N/A
Noons Creek Valve Station	60m x 10m and 45m x 6m	Right of way
Anmore Regulating Station	Not required	N/A

5.8.4 Access Requirements

FEI will use existing public and private roads in order to access locations along the ROWs requiring modifications. Appropriate traffic management will be implemented, as required, adhering to municipal guidelines to ensure safety of the public and construction crews.

5.8.5 Fabrication

All pressure regulating and flow control stations will be fabricated in a shop and transported to site for installation. Piping spools for facilities will also be fabricated in a shop, as much as practically possible, with final fit-up taking place on site.

Valve assemblies and pipe segments to be installed on the pipelines will also be fabricated in a shop or contractor's yard and then transported to site for installation, unless not practical to do so.

5.8.6 Temporary Stop-off and Bypass Requirements to Maintain Supply

FEI must ensure that natural gas supplies are maintained when alterations are taking place. At the same time, the segment of pipe to be replaced needs to be isolated from the rest of the system so that construction crews can replace it. One of the following two methods can achieve both of these objectives:

1. Isolating and purging a segment of pipeline between existing adjacent valves; or
2. Use of stop-off assemblies and bypass piping.

While a majority of locations where modifications will take place can be temporarily isolated by using parallel pipelines for varying periods and subject to weather conditions, there are four locations where stop-off assemblies with bypass piping cannot be avoided. In these locations, the need for temporary bypass is driven by the absence of parallel pipelines that could be used to maintain supply.

The four locations requiring the installation of stopple assemblies and bypass piping to isolate a segment of pipeline so that construction crews can carry out the replacement are identified below:

Table 5-12: Temporary Stop-off and Bypass Scope

Pipeline	Event ID	Location
TIL BEN 323	3	Heavy wall forged elbow replacement; City of Delta
TIL BEN 323	5	Heavy wall forged elbow replacement; City of Delta
CPH BUR 508	14	Heavy wall station pipe replacement; Coquitlam Gate Station
CPH BUR 508	20	Heavy wall crossing pipe replacement; Westwood Regulating Station

5.8.7 Testing

All shop welds will undergo non-destructive examination as per FEI specifications and industry standards. Given the Project's location within an urban environment, pressure testing activities will take place in a fabrication shop or the contractor's yard and pressure testing on site will only take place if absolutely necessary. All closure welds (or golden welds) will undergo non-destructive examination before backfill.

5.8.8 Excavation

Excavations within a facility boundary will be carried out via hand digging or by hydrovac. Hydrovac is the use of pressurized water in conjunction with an industrial strength vacuum to simultaneously excavate and evacuate soil. No mechanical excavations will be allowed within a facility.

Excavation along FEI pipeline ROWs (i.e., outside facility boundaries) will be carried out via a combination of mechanical means, and hand digging or hydrovac. Mechanical excavation will be used to remove the over-burden up to a meter on top of pipe followed by hand digging or hydrovac until the pipe is fully exposed.

In cases where use of an open-cut installation method is unachievable, trenchless installation techniques will be utilized. FEI is proposing trenchless installation for the following three locations.

Table 5-13: Proposed trenchless installation locations

Pipeline	Event ID	Location	Length (m)	Technique
CPH BUR 508	4/5	Lougheed Highway; City of Coquitlam	280	Horizontal Directional Drill (HDD)
CPH BUR 508	20	David Avenue; City of Coquitlam	40	Auger boring
TIL FRA 508	1	River Road; City of Delta	40	Auger boring

5.8.9 Clean-Up and Post-Construction Restoration

Following the completion of construction, FEI will restore construction workspaces and remove any temporary facilities. Further, private properties will be restored to standards allowing for future operational access and only modified if necessary to mitigate local conditions.

5.9 REQUIRED PERMITS AND APPROVALS

5.9.1 Federal

Federal notifications and approvals from DFO may be required to comply with the provisions of the *Fisheries Act*. A Project and Environmental Review may be required from the Vancouver Fraser Port Authority (VFPA) if a pipeline modification requires temporary workspace on VFPA lands.

5.9.2 Provincial

Permits and approvals may be required from several provincial agencies include the BCOGC, Agricultural Land Commission (ALC), Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD), and Ministry of Transportation and Infrastructure (MOTI).

5.9.2.1 *BC Oil and Gas Commission*

The construction and operation of the Project are governed by the *Oil and Gas Activities Act* and are expected to require minor pipeline amendment applications. All pipeline and stations fall under existing pipeline permits through the BCOGC. A Pipeline Amendment Application requires notification to directly impacted Land Owners, Right Holders and Indigenous Groups prior to submission. The Amendment Application process includes engineering details, mapping package, land owner notification, land or access rights, archaeological requirements, design reviews, and environmental permits/approvals for work in and around fish bearing streams. The upgrades that require a Notice of Intent, instead of an Amendment Application, will be submitted approximately 30 days in advance of construction. Permits under Section 11 of the *Water Sustainability Act* for changes in and about a stream or short term water use may be required from the BCOGC.

5.9.2.2 *Agricultural Land Reserve*

Activities on land designated as Agricultural Land Reserve are regulated under the Agricultural Land Commission Act. The construction of the Project will affect lands within the Agricultural Land Reserve (ALR). Works within FEI's ROW within ALR Lands are covered under existing approvals. The terms and conditions outlined in these approvals will be adhered to during the construction of the Project.

5.9.2.3 *Ministry of Transportation and Infrastructure Permits*

Highways and areas under the jurisdiction of the Ministry of Transportation and Infrastructure will require permits under the Transportation Act. 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.

5.9.3 Municipal

The Project construction activities will occur in the following municipalities and regional districts:

- City of Abbotsford
- Village of Anmore
- City of Coquitlam
- City of Delta
- Township of Langley
- City of Port Moody
- City of Richmond
- City of Surrey
- City of Vancouver
- Metro Vancouver

FEI has operating agreements with most of the municipalities affected by the Project except the City of Richmond, Village of Anmore, and Metro Vancouver. Pipeline construction may require additional 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.

5.9.4 Other Permits, Licenses or Authorizations

In addition to approvals from federal, provincial and municipal governments, the Project may require approvals from other third parties including the following:

- CP Rail
- BC Hydro
- Telus
- Rogers,
- Trans Mountain,
- FortisBC Energy Inc. (gas)
- Local government utilities

Additional approvals may be required from Technical Safety BC and WorkSafeBC prior to construction.

5.10 *PROJECT COST ESTIMATE*

FEI, in conjunction with the Project engineering and cost estimation consultant (Stantec), developed the cost estimate for the Project 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 establish the direct and indirect costs.

Stantec estimate includes:

- Pipeline and stations direct construction costs
- Pipeline and stations indirect construction costs
- Materials
- Construction sub-contracts
- Environmental and archaeological costs
- Construction support services
- 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
- Project Services
- External Relations (Community Relations, Indigenous Relations, Communications)
- Environmental / Archaeological

- Regulatory / Permitting
- Property Services
- Legal
- Procurement
- Operations Support
- Health & Safety
- Engineering
- Construction Management

Contingency is discussed in Section 5.10.2.

5.10.1 Basis of Estimate

The Class 3 Cost Estimate and Basis of Estimate are attached in Confidential Appendix D-4. These documents detail:

- Estimate Background:
  - Project Overview
  - Purpose and Objective of the Estimate
- Basis of Estimate:
  - Scope of Work
  - Estimating Methodology
  - Assumptions
  - Exclusions
- Quantity Derivation and Cost Basis:
  - Material Take-Offs (MTOs)
  - Material Cost Basis
  - Crew Sheets (composition and duration)
  - Labour and Equipment Rates
  - Contractor Indirects (mobilization/demobilization, supervision, trucking and maintenance)
  - Allowances
  - Budgetary Quotes and Historical Pricing
  - Sub-Contracts

- Unit Price Items
- Other Costs
- Environmental and Archaeological costs
- Construction Support Services
- Engineering, Procurement and External Consultants
- Potential Risks & Opportunities
- Estimate Summary

5.10.1.1 *Project Cost Estimate Details*

The Total Project capital cost estimate is $137.8 million in as-spent dollars, including AFUDC of $6.1 million. The total Project capital cost also includes contingency of 10 percent that FEI plans to hold based on its 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 10 percent contingency approximates a P50 confidence level and will form the Project capital budget. The following table presents a summary of the Project capital budget.

The risk analysis discussed in Section 5.10.2 used this number as the base estimate.

Table 5-14: Project Capital Budget

Line	Item	Amount
1	Construction Cost Estimate (Contractor)	$ 72.4
2	Owners Costs (FEI)	$ 15.2
3	**Sub-Total Construction Base Cost Estimate ($2020)**	**$ 87.6**
5	Pre-Construction Development Costs	$ 30.7
6	Contingency	$ 14.7
7	**Sub-Total Cost Estimate ($2020)**	**$ 133.0**
8	Cost Escalation Estimate	$ 7.8
9	**Sub-Total Cost Estimate (As-Spent)**	**$ 140.8**
10	AFUDC	$ 6.1
11	Tax Offset	$ (9.1)
12	**Total Project Cost Estimate (As-Spent)**	**$ 137.8**

5.10.1.2 *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
- Independent external reviews of the Class 3 cost estimate was done by Universal Pegasus International (UPI).

5.10.1.3 *Escalation*

All cost estimates, including material supply and construction contracts, were developed based on 2020 market prices. A probabilistic assessment of escalation was completed by an independent expert: Validation Estimating LLC, USA (Validation Estimating, John Hollmann), a company that provides services in estimate validation, risk analysis and contingency estimation.

The escalation analysis was based on price indices forecasted by economic consulting firm IHS Markit, forecasted global and regional capital spending market conditions, and a cash flow developed from the master schedule. This assessment is in accordance with AACE Recommended Practice 68R-11: *Escalation Estimating Using Indices and Monte Carlo Simulation*, and is documented in the report titled "CTS Transmission Integrity Management Capability (TIMC) Project Escalation Estimate" dated November 15, 2020 and provided in Confidential Appendix E-4. This report established the escalation at $7.9 million (5.4 percent of the total base cost plus contingency) that aligns with the P50 confidence level.

5.10.2 Risk Analysis and Contingency Determination

FEI engaged Yohannes Project Consulting Inc. (YPCI), a company specializing in risk management, to conduct a qualitative risk analysis to identify all of the risks associated with the Project. YPCI conducted multiple workshops with impacted stakeholders to develop a risk register (Appendix E-2) for the Project to identify risks that could likely occur. As the engineering advanced on the Project, the probability or the consequence of several risks which were initially identified were either mitigated entirely or reduced to a lesser extent. All of the remaining risks associated with the Project are contained within the Risk Report and included in Confidential Appendix E-1.

FEI also retained Validation Estimating to complete an escalation estimate and a quantitative analysis using an integrated parametric and expected value methodology based on AACE 42R. This analysis is described in the report titled "Capital Cost and Schedule Risk Analysis and Contingency Estimate," dated November 15, 2020 and provided in Confidential Appendix E-3.

Validation Estimating facilitated a series of risk workshops to evaluate the systemic and project-specific risks with the extended project team. Following the acquisition of these required risk inputs, this independent expert quantified the contingency to adequately address Project risks over a multi-year execution timeframe. This risk quantification applies a hybrid approach that combines a parametric model analysis for systemic risks based on empirical knowledge, and an expected value analysis for project specific risks, which assesses probability of occurrence and integrates anticipated cost and schedule impacts. The hybrid approach is in accordance with AACE International Recommended Practices and is documented in the report titled "Capital Cost and Schedule Risk Analysis and Contingency Estimate", dated November 15, 2020 and provided in Confidential Appendix E-3 and is based upon:

- 40R-08 Contingency Estimating – General Principles;
- 42R-08 Risk Analysis and Contingency Determination Using Parametric Estimating; and
- 65R-11 Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Expected Value.

The risk analysis was used to establish a contingency percentage (10 percent) that aligns with the P50 confidence level, based on the current understanding of the Project's risk profile, discrete project risks and to account for possible scope changes.

5.10.2.1 *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 by Stantec and FEI through a risk workshop facilitated by YPCI in June 2020. Furthermore, the risk analyses and identification workshops were collaboratively undertaken with YPCI in August and September 2020, resulting in:

- The risk response actions; and
- 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 5-8.

Figure 5-8: Risk Assessment Matrix

	Risk Impact Category				
CTS TIMC	Scope, Cost, Schedule, Performance, Quality				
	Impact				
Likelihood (Probability)	Very Low	Low	Medium	High	Very High
very High (>50%)					
High (5-50%)		2	1	2	1
Medium (1-5%)			4	1	1
Low (0.1-1.0%)		4	8	4	1
Very Low (<0.1%)	2	3			1

5.10.2.2 *Risk Register, Qualitative Assessment and Action Plan*

The risk identification process identified a number of risks, which were tabulated and included in the YPCI's Risk Report's risk register (Confidential Appendix E-2). 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 risks using the risk assessment matrix noted above.

Probabilistic methods provide a distribution of possible cost and duration outcomes. This allows the decision maker to select a risk funding level to meet their objectives. The first objective is to fund a contingency budget, which per AACE is money or duration that is "expected to be expended" within the business scope, usually under authority of the project manager. For "risk neutral" strategies, the Validation Estimating recommends funding contingency at the mean (expected value); however, the P50 (median) level is often used.

As a result, FEI's recommended contingency for the Project is 10 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.

5.11 *POST PROJECT WORK*

Once the pipeline and facility modifications described in the sections above have been completed for each of the pipelines in the CTS, FEI will undertake the following work:

1. FEI will run EMAT ILI Tools in the CTS pipelines as they become ready;
2. The results of the EMAT ILI tool run will be used to inform integrity digs and repairs, as required; and,
3. Segments with poor quality EMAT ILI data may need further investigation into the presence of cracking threats.

A description of each of these activities is provided in the Table 5-15 below, including the type of cost and likely timing.

Table 5-15: ILI Activities

Activity	Cost Type	Timing
Run EMAT ILI Tools in the CTS: With the required pipeline and facility alterations complete, FEI will schedule and run the EMAT ILI tools in each pipeline. It is estimated that these tools will need to be run at least every seven years to monitor the growth of crack-like threats to the pipeline and to provide information on where FEI needs to respond to and repair any crack-like threats. The actual run frequency for each pipeline will be determined after the initial baseline run, once the condition of the pipeline (with regard to the crack-like features) is better understood.	Capital	Initial runs to begin in 2024. Runs will continue through the useful life of the asset.

Activity	Cost Type	Timing
Perform Integrity Digs and Repairs: Informed by the information gathered by the EMAT ILI tool run, FEI will perform Integrity Digs to validate the data and repair integrity concerns on the pipeline. Interpretation of the EMAT ILI tool data is iterative, and consists of a review of the data and then field validation. There may be multiple phases of integrity digs associated with the same EMAT ILI tool run, with the information gathered from the validation digs fed back into the data analysis.	O&M	2024 through 2030 Integrity Digs for validation and repair will start shortly after the EMAT ILI run, and may continue up to three years after the run.
In-Ditch Inspection of EMAT ILI Tool Blind Spots: If, once the validation digs are complete, there remain sections of the pipeline with deficiencies in the collected data (blind spots), FEI will evaluate the sections to determine whether further work needs to be done to ensure adequate risk identification and mitigation. This evaluation will be based on the following factors: 1. The severity of the data degradation; 2. The condition of the rest of the pipeline; 3. The percent coverage of the tool; and 4. The location of the blind spots. Where required by the evaluation, discrete projects will be raised to mitigate SCC risk at these blind spots. A committee of FEI subject matter experts will determine the length of pipe that needs to be addressed and the method that will be applied to mitigate SCC. Integrity management methods including pipeline replacement (PLR) or pipeline exposure and recoat (PLE) may be used in localized applications where blind spots have occurred and where altering the pipeline to obtain high quality EMAT ILI data is not feasible.	O&M or Capital, in accordance with FEI's Capitalization Policy	2027 through 2032 The Final Report for the EMAT ILI run is a key input for defining these projects, and is likely to take two to three years to receive following a tool run.

To manage the additional work associated with FEI's transmission system integrity management activities as described above, FEI will require additional headcount in its System Integrity, Gas Control, and Operations departments, as well as new double block and bleed tools to perform repair work. The extent of post project work required cannot be confirmed until the EMAT ILI tool has been run on each pipeline, integrity digs have been performed, and results interpreted.

FEI will request approval of the incremental increase in O&M or Sustainment Capital either in the MRP Capital Forecast Update filed as part of the 2023 Annual Review, or in the next MRP or RRA filing, depending on when the runs are planned. As integrity digs have been approved for flow-through treatment during the term of the MRP, FEI will bring forward requests for any additional integrity dig costs that are associated with the capabilities enabled by the CTS TIMC Project in its annual reviews under the MRP.

5.12 CONCLUSION

In this section, FEI described the proposed CTS TIMC Project in detail. In the Project, FEI will perform pipeline and facility modifications required to ready the CTS for EMAT in-line inspection. After the Project, FEI expects additional resource and material needs because of the EMAT findings following the completion of the Project.

6. PROJECT COSTS, FINANCIAL ANALYSIS, ACCOUNTING TREATMENT AND RATE IMPACT

6.1 *INTRODUCTION*

The CTS TIMC Project has a Total Cost Estimate of $137.8 million. This section describes the actual and forecast costs in the TIMC Development Cost deferral account, provides a breakdown of the Project costs, summarizes the financial analysis, and details the accounting treatment of capital costs and rate impact of the Project.

6.2 *TIMC DEVELOPMENT COST DEFERRAL ACCOUNT*

As discussed in sections 1.2.2 and 5.3, FEI received BCUC approval with Order G-237-18, granting the creation of the non-rate base TIMC Development Cost deferral account. The deferral account was approved to attract a WACC return, with disposition to be proposed in a future application.

Costs captured in the TIMC deferral account include Preliminary Stage Development Costs, Pre-Construction Development Costs, and Application Costs:

- Preliminary Stage Development Costs consist of the QRA of FEI's transmission pipeline assets and the EMAT ILI Pilot project costs as discussed in Section 5.3.2.
- The Pre-Construction Development Costs include the costs related to front-end engineering and design, CPCN development costs including environmental assessments, First Nations and stakeholder consultations.
- CPCN application costs consist of costs for the regulatory process to review the Application. The cost estimate is based on a written process with two rounds of IRs and one workshop. The forecast application costs included are in line with the final costs for the IGU CPCN Application, adjusted to include the new Residential Consumers Intervener Group.

As set out in the Table 6-1 below, the December 31, 2020 ending balance in the TIMC deferral account is $9.2 million, based on gross costs of $23.7 million and $1.2 million of WACC return, less $9.3 million transferred to construction work-in-progress, less tax recovery of $6.4 million. The $9.3 million of construction work-in-progress that will be part of the Project capital cost was based on a year-end financial review of the deferral costs to determine which ones would be eligible for capitalization.

In 2021, FEI forecasts to spend $9.5 million on the last stages of Pre-Construction Development and $0.5 million on Application Costs. The $9.5 million of Pre-Construction Development Costs includes $3.9 million of costs related to QRA sustainment and EMAT inspections that will be capitalized. The forecast costs related to project scoping, planning, development, and regulatory proceeding costs will remain in the deferral.

Table 6-1: TIMC Development and Deferral Costs ($000s)

		Actual Costs ending December 31, 2020			2021 - Estimated Costs			
Line	Particular	Preliminary Stage Development Costs (1)	Pre-Construction Development Costs (2)	Total Pre-2021 Costs (3)	Pre-Construction Development Costs (4)	CPCN Application Costs (5)	Total 2021 Estimated Costs (6)	Total Column 3 + 6 (7)
1	Pre-Tax Costs [1]	14,641	9,100	23,741	6,573	510	7,083	30,824
2	Contingency [2]				2,900	41	2,941	2,941
3	**Subtotal: Development Costs**	**14,641**	**9,100**	**23,741**	**9,473**	**551**	**10,024**	**33,765**
4	Income Tax Recovery	(3,953)	(2,457)	(6,410)	(2,558)	(149)	(2,707)	(9,117)
5	Financing, WACC after tax	1,004	240	1,244	587	11	598	1,842
6	**Subtotal: Costs after tax and AFUDC**	**11,691**	**6,883**	**18,574**	**7,503**	**413**	**7,916**	**26,490**
7	Cost Capitalized [3]		(9,340)	(9,340)	(3,907)	-	(3,907)	(13,247)
8	**Total Deferral Costs**	**11,691**	**(2,457)**	**9,234**	**3,596**	**413**	**4,009**	**13,243**

Notes:

[1] Column 7 agrees to Table 5-3.

[2] A portion of total project contingency seen in row 5 in table 6-2 has been allocated to the forecast development costs.

[3] Cost Capitalized include Pre-Tax Costs, Contingency, and Financing WACC.

In total, FEI forecasts $33.8 million in gross development costs including contingency, less $9.1 million in income tax recovery, plus $1.8 million in financing costs, resulting in $26.5 million in development costs. FEI will capitalize $13.2 million of development costs related to the base line QRA, QRA sustainment, and EMAT inspections. This results in $13.2 million in development costs remaining in the deferral account at December 31, 2021.

FEI proposes to recover the balance of costs in the deferral account associated with the development of the CTS TIMC Application estimated at $13.2 million by amortizing the December 31, 2021 actual balance of those costs over 3 years commencing in 2022. The capitalized development costs, also estimated at $13.2 million, will enter rate base at January 1, 2022.

Note that FEI will continue to record costs associated with the future ITS TIMC application in the same deferral account, but these costs will be tracked and recorded separately from the CTS TIMC development costs and disposition will be requested as part of the ITS TIMC CPCN application.

6.3 SUMMARY OF PROJECT COSTS

Table 6-2 below summarizes the total Project costs including pipeline and stations construction costs, project management and owner's costs, contingency, project development costs, and AFUDC, in both 2020 and as-spent dollars.

Table 6-2: Summary of Forecast Capital and Deferred Costs ($millions)

Line	Item	2020 $	As-Spent	Reference
1	Pipeline Construction Costs	35.895	38.930	Section 5.4 and Confidential Appendix D-4
2	Stations Construction Costs	36.470	39.266	Section 5.5 and Confidential Appendix D-4
3	Project Management and Owner's Costs	15.247	16.166	Section 5.10
4	Subtotal Project Capital Cost	87.613	94.362	
5	Contingency	14.691	15.624	Section 5.10.2 and Confidential Appendix E-3
6	Subtotal Contingency	14.691	15.624	
7	CPCN Application Costs	0.500	0.510	Section 6.3.2
8	Preliminary Stage Development Costs	18.366	18.436	Section 6.3.2
9	Pre-Construction Development Costs	11.847	11.878	Section 6.3.2
10	Subtotal Development and Deferral Costs	30.714	30.824	Table 6-1, Row 1, Col 7
11	AFUDC		6.150	Table 6-3, Row 21, Col 5
12	Tax Offset		(9.117)	Table 6-3, Row 21, Col 4
13	**Total Project Cost**	**133.018**	**137.843**	Table 6-3, Row 19, Col 7

6.4 *FINANCIAL ANALYSIS*

FEI has performed a financial evaluation of the Project based on the present value (PV) of the incremental revenue requirement and the levelized delivery rate impact to FEI's non-bypass customers over a 70-year analysis period. The 70-year analysis period is based on a 65 year post-project analysis period plus five prior years. The five prior years, 2021-2024, relate to the construction period, and the subsequent year, 2025, relates to the project close out period. All new assets will be in-service by January 1, 2026. The 65-year post-project analysis period is the average service life (ASL) of transmission mains pooled asset account 46500 as detailed in FEI's 2017 depreciation study approved with Order G-165-20 as part of FEI's 2020-2024 Multi-Year Rate Plan (MRP) Application.

Table 6-3 below provides the breakdown of the Project capital costs of $137.843 million (as-spent dollars) into asset and deferral account components.

Table 6-3: Summary of Forecast Capital and Deferred Costs ($millions)

Line	Particular	As-Spent	Owners Costs	Contingency	Tax Offset	AFUDC	Total	Reference [1]
		(1)	(2)	(3)	(4)	(5)	(6)	
1	**Pipeline Construction:**							
2	46500 - Mains Installation	38.930	8.048	7.945		1.949	56.873	Schedule 6, Line 10 + Line 19, Years 2021-2025
3	Subtotal Pipeline Construction	38.930	8.048	7.945	-	1.949	56.873	Line 2
4	**Station Construction:**							
5	46500 - Mains Installation	31.412	6.494	3.791		1.383	43.081	Schedule 6, Line 11 + Line 20, Years 2021-2025
6	46710 - Measuring and Regulating Equipment	3.927	0.812	0.474		0.173	5.385	Schedule 6, Line 12 + Line 21, Years 2021-2025
7	46720 - Telemetry	3.927	0.812	0.474		0.173	5.385	Schedule 6, Line 13 + Line 22 Years 2021-2025
8	Subtotal Station Construction	39.266	8.118	4.738		1.729	53.851	Line 5 + Line 6 + Line 7
9								
10	**Capitalized Development Costs:**							
11	Pre-Construction Development Costs - 46520 Mains Inspection [2]	11.878		1.130		0.869	13.877	Schedule 6, Lines 3+7+15+24, Years 2021-2025
12	Subtotal TIMC Capitalized Development Costs	11.878	-	1.130	-	0.869	13.877	Line 11
13	**TIMC Deferral Additions:**							
14	Application & Preliminary Stage Development Costs	18.946		1.811	(5.605)	1.602	16.755	
15	Tax Offset on Pre-Construction Development Costs				(3.512)		(3.512)	
16	Subtotal TIMC Deferral Additions	18.946	-	1.811	(9.117)	1.602	13.243	Schedule 9, Line 9, Year 2021
17	Total TIMC Deferral and Capitlized Development Costs	30.824	-	2.941	(9.117)	2.472	27.120	Line 12 + Line 17
18								
19	**Total**	**109.019**	**16.166**	**15.624**	**(9.117)**	**6.150**	**137.843**	Line 3 + Line 8 + Line 12 + Line 16

Notes:

[1] Reference refers to Appendix G-2 Financial Schedules

[2] $0.869 million AFUDC amount includes $0.240 million WACC transferred from the TIMC deferral account and $0.630 million AFUDC on capital costs

Table 6-4 below summarizes the financial analysis based on the assumptions discussed in this section. The present value of the incremental revenue requirement is approximately $147.460 million and the levelized delivery rate impact is 0.94 percent.

Details of the financial evaluation of the Project can be found in the financial schedules included in Confidential Appendix G-2.

Table 6-4: Financial Analysis of the Project ($millions)

Line	Particular	Project [a]	Reference (Confidential Appendix Financial Schedules)
1	Total Charged to Gas Plant in Service ($ millions)	124.600	Schedule 6, Line 35, less Table 6-4 Line 4
2	Total Project Deferral Cost	13.243	Schedule 9, Line 2 + Line 7
3	**Total Project Cost - Excluding Sustainment Capital ($ millions)**	**137.843**	**Sum of Line 1 & Line 2**
4	Sustainment Capital [b]	84.983	Schedule 6, Sum of lines 12 & 13, 2026-2090
5	**Total Project Cost - Including Sustainment Capital ($ millions)**	**222.826**	**Sum of Line 3 & Line 4**
6	Incremental Rate Base in 2026 ($ millions)	107.257	Schedule 5 Line 19 (2026)
7	Incremental Revenue Requirement in 2026 ($ millions)	11.588	Schedule 1 Line 11, (2026)
8	**PV of Incremental Revenue Requirement 70 Years ($ millions)**	**147.460**	**Schedule 10, Line 25**
9	Net Cash Flow NPV 70 Years ($ millions)	(4.718)	Schedule 11, Line 17
10			
11	Delivery Rate Impact in 2026 (%)	1.32%	Schedule 10, Line 28 (2026)
12	**Levelized Delivery Rate Impact 70 years (%)**	**0.94%**	**Schedule 10, Line 32**
13	Levelized Delivery Rate Impact 70 years ($/GJ)	0.042	Schedule 10, Line 45

Notes:

[a] Confidential Appendix G-2 – Financial Schedules

[b] Sustainment Capital allowance included to refresh end of life Telemetry and Measuring Equipment, original estimate inflated at 2 percent per annum every 11 years

6.5 *ACCOUNTING TREATMENT*

6.5.1 Treatment of Capital Costs

Consistent with FEI's approved CPCN treatment, the capital costs of the Project will be held in Capital Work In Process, attracting AFUDC[67]. As construction is completed on the various assets included in the Project, the assets will be commissioned and placed into service. The assets will enter rate base on January 1 of the year following their in-service date by adding the capital cost of the assets into the appropriate plant asset accounts. Depreciation of the assets included in FEI's rate base will begin the year that they enter rate base.

6.5.2 Rate Impact

As discussed above, FEI expects to complete construction of the Project in 2024 with final cloe out activities in 2025, such that the last of the assets enter rate base on January 1, 2026. Combined with the amortization of the deferral account costs beginning in 2022, the incremental impact to customer delivery rates will change each year from 2022 to 2026 as set out in the table below. Table 6-5 sets out the annual delivery rate impact compared to the 2021 non-bypass revenue requirement and the incremental annual delivery rate impact in percentage terms for years 2022 to 2026 of the Project.

Table 6-5: Summary of Rate Impact of the Project

Project Rate Impacts	2022	2023	2024	2025	2026
Annual Delivery Margin, Incremental to 2021 Approved, Non-Bypass ($millions)	10.726	11.004	10.691	11.461	11.588
% Increase to 2021 Approved Delivery Margin, Non-Bypass	**1.22%**	**1.25%**	**1.22%**	**1.30%**	**1.32%**
Incremental % Delivery Rate Impact (Year-over-Year)	**1.22%**	**0.03%**	**-0.04%**	**0.09%**	**0.01%**
Average Annual % Delivery Rate Impact (5 years, 2022-2026)	0.26%				
Average Annual Delivery Rate Impact (5 years, 2022-2026), $/GJ	0.013				
Cumulative % Delivery Rate Impact (5 years, 2022-2026)	1.32%				
Cumulative Delivery Rate Impact (5 years, 2022-2026), $/GJ	0.066				

The Project will result in an estimated cumulative delivery rate impact of 1.32 percent by 2026 when all construction is completed and all capital costs have entered FEI's rate base. The average annual delivery rate impact over the five years from 2022 to 2026 is estimated to be 0.26 percent annually or $0.013 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an average bill increase of approximately $1.19 per year over the five years, or $5.96 cumulatively by 2026.

6.6 *CONCLUSION*

In summary, the CTS TIMC Project has a Total Cost Estimate of $137.8 million and will result in an estimated delivery rate impact of 1.32 percent in 2026 when all construction is complete and after all assets are placed in service. For a typical FEI residential customer consuming 90 GJs per year, this would equate to an approximate average bill increase of $5.96 per year.

[67] FEI's 2021 AFUDC rate is 5.47 percent, which is equal to the after-tax weighted average cost of capital.

7. ENVIRONMENT AND ARCHAEOLOGY

7.1 INTRODUCTION

FEI is committed to delivering safe and reliable energy in an environmentally responsible manner to all the communities that it serves. Based on its preliminary environmental and archaeological assessment, FEI expects that the Project's scope, which is confined to existing rights of way and facilities, will have low to moderate environmental and archaeological impacts.

The Environmental Overview Assessment (EOA) of the Project concludes that the environmental risk of the Project is low to moderate (Appendix H). FEI will mitigate the potential environmental impacts of the Project through the implementation of standard best management practices and mitigation measures. FEI will also minimize the impacts to construction timelines and costs resulting from encountering species at risk, fish habitat, or contaminated soil or groundwater through additional investigations during the detailed engineering phase prior to construction.

FEI assessed the Project for high-level archaeological constraints in an Archaeological Constraints Report (ACR), included as Appendix I. The ACR concluded that the events and facilities may have elevated archaeological potential, with the exception of Fraser Gate Station which has low archaeological potential. No registered archaeological or heritage sites overlap with the Project footprint. As recommended by its archaeological consultant and to further assess the Project's potential archaeological impacts, in 2021 FEI will be conducting an Archaeological Overview Assessment (AOA) to determine archaeological potential, and an Archaeological Impact Assessment (AIA) for areas assessed as having elevated or high archaeological potential in the AOA. 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. If the results of the AIA determine that work is to take place in proximity to archaeological sites, monitoring during excavation works will be conducted, as per the recommendations of the archaeologist.

The remainder of this section is organized as follows:

- Section 7.2 describes the potential environmental impacts identified through the EOA and how these impacts can be mitigated through additional assessment, the implementation of best management practices and mitigation measures, and municipal, regional, provincial and federal permitting processes.
- Section 7.3 describes the potential archaeological impacts identified by the preliminary archaeological constraints assessment and how these impacts can be mitigated through additional assessment, the implementation of standard best management practices, and provincial and Indigenous permitting processes.

7.2 ENVIRONMENT

In this section, FEI describes its approach and plan with respect to the identification, management, and mitigation of potential environmental impacts associated with the Project.

Stantec Consulting Ltd. (Stantec)[68] was retained to complete an EOA of the pipeline events, comprising of the replacement of 13 heavy wall pipeline segments within the existing rights of way of six CTS pipelines, and 13 alterations to existing facilities.[69] The EOA provides a basis for the completion of detailed assessments and preparation of environmental management plans prior to construction commencement.

The EOA was based on a combination of a desktop review of available information and preliminary field reconnaissance surveys. The assessment was completed to identify and describe the potential impacts to the biophysical environment from the Project and determine recommended impact mitigation. Detailed descriptions of potential impacts to the biophysical environment and recommended mitigations can be found in Section 5.0 of the EOA Report filed as Appendix H.

As described in the EOA, potential Project impacts vary by location but may include disturbance to environmental features such as terrestrial and aquatic resources, species at risk, and soils.

Based on this preliminary assessment, the overall environmental risk of the Project is low to moderate. Any potential environmental impacts from the Project can be mitigated through the application of standard environmental best management practices and mitigation measures.

7.2.1 Environmental Overview Assessment (EOA)

The results of the work completed by Stantec are outlined in the EOA (Appendix H), including a review and description of environmental resources which may be impacted by, or influence, Project construction. In particular, the EOA identifies significant natural features, such as fish, wildlife, and terrestrial habitat that could potentially be impacted by Project construction, as well as environmental constraints that could impact the Project's construction costs and schedule. The EOA also identifies land use across the Project footprint and locations where soil, trench water, or groundwater contamination may be present, which could impact the Project's construction costs, and schedule. These impact areas are summarized in the following sections:

- Land use;
- Contaminated sites (water and soil);
- Fish and fish habitat;
- Vegetation (including noxious plants); and
- Wildlife (including species at risk).

[68] Stantec is a multi-discipline consulting company that provide professional expertise in environmental sciences, social sciences, and engineering.
[69] Refer to Table 5-1 and as described in detail in Sections 5.4 and 5.4

Section 5.0 of the EOA also identifies proposed best management practices and mitigation measures to minimize effects to significant natural features. The EOA references three study areas:

- Field assessment study area – a 10 m buffer on either side of the centreline (20 m total width);
- Wildlife study area – a 1 km buffer on either side of the centreline (2 km total width), and surrounding the facilities; and
- Contaminated sites study area – a 250 m buffer on both sides of the centreline (500 m total width) and surrounding the facilities.

Some identified environmental resources are within a study area, but not within the Project footprint (e.g., wildlife). As such, these features will be considered further during the Project's detailed engineering phase.

7.2.1.1 *Current Land Use*

Land use varies across the Project, covering six municipalities in the Lower Mainland. Depending on the length of the pipe segment, the proposed pipeline events may overlap with more than one land use category as designated by municipal official community plans. While facilities are considered to be industrial land, the land use surrounding each facility varies. Table 7-1 provides the current land use of the pipeline events and facilities within the Project's scope. Additional details regarding land use is also provided in section 3.2 of the EOA (Appendix H).

Table 7-1: Land Use

Event	Land Use				
	Industrial	Residential / Urban	Commercial / Industrial	Agricultural / Rural	Greenspace
Pipelines					
TIL BEN 323, Event 3				X	
TIL BEN 323, Event 5				X	
TIL FRA 508, Event 1	X				
TIL FRA 508, Event 6	X				
LIV COQ 323, Event 9				X	
HUN NIC 762, Event 36		X			

Event	Land Use				
	Industrial	Residential / Urban	Commercial / Industrial	Agricultural / Rural	Greenspace
Pipelines					
HUN NIC 762, Event 41	X	X			
CPH BUR 508, Event 1	X				
CPH BUR 508, Event 4 / 5	X	X			
CPH BUR 508, Event 9		X			
CPH NOO BUR, Event 14			X		
CPH NOO BUR, Event 20					X
HUN ROE 1067, Event 12				X	
Facilities					
Benson Regulating Station				X	
Tilbury LNG Plant			X		
Tilbury Regulating Station			X		
Faser Gate Station		X			
Nichol Valve Station		X			X
Roebuck Valve Station		X			
Port Mann Valve Station					X
Linvingston Regulating Station		X			
Cape Horn Regulating Station	X				
Coquitlam Regulating Station			X		
Noons Creek Valve Assembly					X
Huntington Control Station				X	
Anmore Regulating Station			X		

7.2.1.2 *Contaminated Sites*

Locations where there is a medium to high potential for encountering soil or groundwater contamination within the Project footprint may impact the Project's construction cost, and schedule. These areas are defined as Areas of Potential Environmental Concern (APEC)s.

Five APECs were identified in the contaminated sites study area and are summarized in the EOA (Appendix H) and in Table 7-2 below. FEI has not yet analysed soil used as fill on the exiting right-of-way for contamination. Prior to or during construction, these soils will be assessed to assist in identification of appropriate disposal facilities.

Table 7-2: Registered Contaminated Sites and APECs Overlapping with Project Components

Pipeline	APEC Address	Distance from Event	Description
HUN NIC 762, Event 41	9470 192 Street, Surrey	Onsite	Large commercial vehicle storage
TIL FRA 508, Event 1	7389 River Road, Delta	Onsite	Husky fuel service station 2014: waste generator (fuel)
TIL FRA 508, Event 1	34 – 7621 Vantage Way, Delta	35 m southwest	Dry-cleaning facility
CPH NOO 508, Event 14	775 Mariner Way, Coquitlam	15 m southwest	Fire station
TIL LNG, Tilbury LNG Plant	7651 Hopcott Road, Delta	Onsite	Natural gas processing 2014: further investigation required by BC Ministry of Environment and Climate Change

FEI will undertake further assessment of APECs during the detailed engineering phase of the Project to minimize the risk they may pose to the Project's construction costs and schedule.

7.2.1.3 *Fish and Fish Habitat*

The EOA assessed the potential for watercourses (e.g., stream, ditch, or wetland) and fish species at risk within the Project study area. As set out in Table 7-3 below, six events are located within 30 m of a watercourse.

Two fish species of conservation concern also occur within 1 km of Project components: white sturgeon and Salish sucker. Neither are expected to be impacted by Project construction.

Table 7-3: Aquatic Resources in Proximity to Project Components

Event	Approx. Distance to Waterbody	Waterbody Type	Provincial Waterbody Classification
TIL BEN 323, Event 3	10 m from Burns Bog 5 m from ditches	Wetland, ditches	S4
TIL BEN 323, Event 5	2 m	Ditch	S4
TIL FRA 508, Event 6	12 m	Ditch	S3

Event	Approx. Distance to Waterbody	Waterbody Type	Provincial Waterbody Classification
CPH NOO 500, Event 4	0 m (trenchless crossing)	Ditches, wetland	S3 - Ditches beside Lougheed Highway
CPH NOO 500, Event 5	0 m (trenchless crossing)	Ditches, wetland	S3 - Ditches beside Lougheed Highway
CPH NOO 500, Event 20	15 m	Ditch	NCD[70]

7.2.1.4 *Vegetation*

Vegetation resources including plant species at risk, ecological communities at risk, and noxious plant species were reviewed as a part of the EOA. The following vegetation resources were identified:

- One plant species at risk with potential to occur in or adjacent to the Project study area;
- One ecological community at risk with potential to occur in or adjacent to the Project study area; and
- Six noxious plant species with potential to occur or having mapped occurrences within the Project study area.

7.2.1.5 *Wildlife*

The wildlife study area was reviewed using a desktop review to determine use by known wildlife and species at risk, and to assess the species' potential presence.

- Twelve wildlife species of conservation concern have been recorded within 1 km of Project events.
- Eight events are within 3 km of Critical Habitat.
    - Two of these events overlap with designated Critical Habitat (CPH NOO 508, Event 4 & 5).

Section 3.0 of the EOA (Appendix H) describes the presence of these and other terrestrial resources occurring on or near Project components, such as patches of mature forest.

7.2.2 Implementation of Best Management Practices & Mitigation Measures

Section 5.0 of the EOA (Appendix H) describes best management practices and mitigation measures to minimize and avoid potential negative effects of the Project, including:

[70] NCD – Non-classified Drainage

- Design considerations to avoid potential environmental effects where practicable;
- Apply best practices for managing noxious plants;
- Adhere to general wildlife measures;
- Complete fish and wildlife salvages;
- Minimize vegetation removal; and
- Adhere to least-risk timing windows (e.g., bird nesting and fish spawning seasons) to protect fish species, breeding birds, and sensitive periods for other wildlife species.

During construction, FEI will follow the best management practices and mitigation measures identified in the EOA as applicable to the Project.

7.2.3 Permitting

Based on the results of the EOA completed by Stantec, the Project will likely require permitting/authorization under the legislation, regulations, and bylaws described in Section 5 of this Application.

During the detailed engineering phase of this Project, FEI will undertake further environmental assessments to confirm permitting requirements and will apply for permits as required. The permits identified at this time are based on the current level of Project engineering and may change during the detailed engineering phase.

7.2.4 Further Plans

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

FEI will develop site specific mitigation strategies, as described in the Section 5.0 of the EOA (Appendix H), to offset any potential impacts associated with the Project and potential impacts caused by the environment (e.g., weather events). All required environmental permits and approvals for the Project will be identified and applied for prior to construction 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 and requirements. Contractors will be required to review and abide by the project-specific Environmental Management Plan (required as a part of the application to the BCOGC), submit task-specific Environmental Protection Plans, and retain the services of environmental monitor(s) prior to commencement of construction activities for the Project.

Environmental monitoring will be undertaken during all sensitive aspects of the work program. The purpose of environmental monitoring during construction is to oversee the natural and social environments, to monitor for any adverse effects, and to verify that the construction site is returned to pre-construction conditions as soon as possible. This includes monitoring compliance with applicable environmental legislation, regulations, industry standards, and project permit conditions, including any notification requirements or conditions set by the regulator. The environmental monitor will provide inspection of contractor environmental mitigation measures and respond to any environmental issues that may develop during construction. They will have "stop work authority" in the event that works underway are deemed to pose a potential impact to the natural environment.

FEI will also retain the services of a qualified environmental professional to undertake environmental auditing inspections. The environmental auditor will review environmental monitoring reports, inspect the contractor's environmental mitigation and protection measures, and ensure compliance with requirements of the Environmental Management Plan, Environmental Protection Plans, and applicable permits. Post-construction inspections will also be conducted to ascertain the success of the restoration effort and mitigation measures, including any notification requirements or conditions set by the regulator.

7.3 *ARCHAEOLOGY*

FEI retained Stantec to complete an ACR of the Project to assess archaeological and/or cultural heritage resources within the Project area (Archaeological Constraints Report - Appendix I). The ACR determined the necessity and, as required, the scope of additional archaeological assessments (e.g., AOA and AIA) prior to the commencement of ground disturbing activities. Due to the current Project schedule, FEI will be conducting an AOA during the detailed engineering design phase.

The ACR consisted of a desktop review that examined an existing archaeological potential model for the Project components, queries of the Remote Access to Archaeological Data application, Provincial Archaeological Report Library, Provincial Consultative Areas Database, and orthophoto imagery. The AOA will be conducted once FEI's archaeologist obtains the necessary permits from Indigenous groups

7.3.1 Archaeology Constraints Report

The ACR encompassed the 13 events and 13 facilities that form the Project's components. As part of the ACR, Stantec reviewed a range of environmental, archaeological, cultural and historical information and assessed the Project for high-level archaeological potential and overlap with known archaeological and historic heritage sites.

The ACR did not identify any registered archaeological sites or registered historic heritage sites overlapping the Project study area. The HUN ROE 1067 Event 12 and Huntington facility are within areas of modelled high archaeological potential, and will require AIA work. Fraser Gate

Station was assessed by Stantec in 2014 during the development of the Lower Mainland Intermediate Pressure System Upgrade Project as having low archaeological potential, therefore no further archaeological assessment is required. The remaining 12 events and 11 facilities have no modelled archaeological potential and an AOA is therefore recommended to assess archaeological potential and to confirm where AIA will be conducted.

The objective of the AOA will be to identify archaeological and historic heritage resources within the Project footprint and, if present, to evaluate impacts to those resources as a result of the Project and to provide recommendations to effectively manage the impacts to those resources stemming from the Project. It is expected that the AOA will begin during the detailed engineering phase of the Project, once Indigenous cultural heritage permits have been obtained. At a minimum, AIA has been recommended at seven events and four facilities for areas where ground disturbance activities are anticipated. The AIA will provide a detailed assessment to allow for development of site specific mitigation strategies to manage any potential impacts to archaeological and historic heritage sites associated with the Project.

A permit will be required under Section 12.2 of the *Heritage Conservation Act* (HCA) in order to undertake AIA activities. FEI will obtain any Indigenous cultural heritage permits that are applicable at the time of the AOA and AIA. AIA work will be completed where Project components overlap with areas of moderate or high archaeological potential identified during the AOA. AIA work may begin during the detailed engineering phase and continue throughout construction, especially in areas of potentially deep buried cultural deposits.

7.3.2 Participation of Indigenous Groups

As the ACR was a desktop review, Indigenous groups with an interest in the Project area were not notified. However, prior to the onset of the AOA and AIA, Indigenous groups will be contacted and, where applicable, Indigenous cultural heritage permits will be obtained. The notification will outline the intended work, invite community members to participate in the AOA and AIA, and, upon completion of the draft reports, these groups will be offered an opportunity to provide additional information or comments. Please refer to Section 8.3 of this Application for detailed information regarding Indigenous engagement.

Based on Consultative Areas Database (CAD) the following Indigenous groups will be contacted as a part of the AOA and AIA:

Indigenous Groups	
Cowichan Tribes	Seabird Island Band
Halalt First Nation	Semiahmoo First Nation
Katzie First Nation	Shxw'ow'hamel First Nation
Kwantlen First Nation	Skawahlook First Nation
Kwikwetlem First Nation	Soowahlie First Nation
Lake Cowichan First Nation	Squamish Nation
Leq'á:mel First Nation	Stó:lō Tribal Council

Indigenous Groups	
Lyackson First Nation	Stó:lō Nation
Matsqui First Nation	Sumas First Nation
Musqueam Indian Band	Stz'uminus First Nation
Penelakut Tribe	Tsawwassen First Nation
Peters First Nation	Tseil-Waututh Nation

Of these, Musqueam Indian Band, Kwantlen First Nation, Squamish Nation, Tsleil-Waututh Nation, and the Stó:lō Research and Resource Management Centre currently maintain cultural heritage permitting systems.

7.3.3 Further Plans

Potential impacts to archaeological and historic heritage sites will be further assessed during the AOA and AIA, which will be initiated during the detailed engineering phase of the Project. The AOA will recommend locations where the AIA will be undertaken. It is anticipated that the majority of AIA will be completed prior to construction, though it is understood that archaeological monitoring of portions of the Project may have to be conducted concurrently with construction (e.g., areas with potentially deep buried resources, access constraints or where ground conditions are not suitable for manual testing). HCA and Indigenous cultural heritage permits will be obtained during the detailed engineering phase of the Project and, if necessary, during the construction phase of the Project.

The Project's Envionmental Management Plan, which will include mitigations and recommendations to avoid impact to archaeological resources, will be prepared and included in the contractor RFP documents. The Envionmental Management Plan is also required as a part of the application to the BCOGC. Environmental Protection Plan(s) specific to the Project, including protection of archaeological, historic heritage, and cultural resources, will be developed by successful contractor(s) prior to commencement of the Project.

Where required, archaeological monitoring will be undertaken during all archaeologically sensitive aspects of the work. A designated archaeological monitor will have "stop work authority" in the event that works underway have the potential to result in unauthorized impacts to archaeological, historic heritage or cultural resources.

7.4 CONCLUSION

As described in the sections above, FEI has assessed the environmental and archaeological impacts of the Project and expects that the Project will have low to moderate environmental and archaeological impacts.

Based on the EOA, the environmental risks of the Project are low to moderate and any potential environmental impacts of the Project can be mitigated through the implementation of standard best management practices and mitigation measures.

FEI will be conducting an AOA for the Project in early 2021 to further assess the potential archaeological impacts. FEI also plans to conduct an AIA for the Project to further assess potential archaeological and cultural impacts associated within areas of moderate and high archaeological potential identified in the AOA. 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.

8. CONSULTATION AND ENGAGEMENT

8.1 *INTRODUCTION*

Consultation, engagement and communication are integral to FEI's project development process. To ensure that stakeholders, including municipalities, customers, residents, and businesses, and Indigenous groups have a meaningful opportunity to learn about and provide input into the Project, FEI created a Consultation and Engagement Plan (Appendix J-1) that sets out the general approach to consultation and engagement activities and will be used to guide activities throughout the Project's lifecycle. The plan has been designed in consideration of the specific nature of the project, which is planned to occur along existing rights of way and within FEI premises. As a result, FEI's engagement activities are targeted towards Indigenous groups, municipalities and those stakeholders who live and work in close proximity to the Project.

FEI initiated consultation and engagement for the Project in October 2020, with the distribution of project information letters to nine municipalities and 25 Indigenous groups that may be impacted by project activities. FEI also distributed project information letters to residents and businesses adjacent to the rights of way, and those nearby the rights of way and worksites. FEI followed up with stakeholders and Indigenous groups to confirm receipt of project information letters and to respond to any questions. FEI's follow-up activities to date have included phone calls, emails, meetings and presentations, as requested. FEI continues to track the project-specific interests, issues and concerns of stakeholders and potentially impacted Indigenous groups. A dedicated project website, email address and phone line were set up to provide more information and to support conversations with the public. FEI will continue working with stakeholders to address any outstanding items related to the Project.

Due to the COVID-19 pandemic, FEI assessed its consultation and engagement requirements, as outlined in the Consultation and Engagement Plan, and adapted its approach to address COVID-19 safety requirements. For example, rather than in-person meetings, FEI consulted interested parties via email, phone and video conference. FEI understands the significant and ongoing impact of the COVID-19 pandemic on communities, and as such, continues to adapt its consultation methods to ensure adequate consultation and engagement opportunities are safely available for stakeholders and Indigenous groups.

This section is organized as follows:

- Section 8.2 describes how FEI is undertaking, and will continue to undertake, appropriate public consultation regarding the Project; and
- Section 8.3 describes how FEI is undertaking, and will continue to undertake, appropriate engagement with Indigenous groups regarding the Project.

All consultation and engagement activities are recorded in the Consultation Log (Appendix J-2) and the Indigenous Engagement Log (Appendix K-4).

8.2 FEI IS UNDERTAKING APPROPRIATE PUBLIC CONSULTATION

FEI recognizes the importance of meaningful consultation and of developing, maintaining and enhancing strong stakeholder relationships. To support the successful completion of the Project, FEI's interactions with stakeholders will continue to be open, transparent and consistent.

FEI began public consultation with respect to the Project in October 2020. Initial consultation activities introduced the Project to stakeholders, including municipalities, customers, residents and businesses. During this period, FEI shared project information and sought feedback to support project planning and development.

The subsections below are organized around the following points:

- Section 8.2.1: FEI adopted appropriate communication and public consultation objectives;
- Section 8.2.2: FEI identified stakeholders who may be impacted by the Project with whom FEI has and will continue to consult;
- Section 8.2.3: FEI used appropriate communication materials and methods to consult with stakeholders regarding the Project;
- Section 8.2.4: FEI's public consultation was guided by appropriate community, social and environmental considerations;
- Section 8.2.5: FEI has undertaken appropriate public consultation activities to date, and will incorporate feedback as the Project progresses;
- Section 8.2.6: FEI has responded to the issues and concerns raised by customers, residents, businesses and stakeholder groups;
- Section 8.2.7: FEI intends to undertake future consultation activities, including meetings, letters/emails and virtual information sessions; and
- Section 8.2.8: FEI will address any existing or future outstanding issues or concerns.

8.2.1 FEI Has Adopted Appropriate Communication and Public Consultation Objectives

Consistent with industry best practices, FEI identified and adopted a number of objectives to guide public consultation and to solicit community feedback throughout the Project, as follows:

- Ensure balanced and objective information is provided to all affected and interested stakeholders;
- Communicate the benefits of the Project (e.g., reliability and integrity of FEI's system), and potential positive socio-economic impacts to communities during construction;
- Provide opportunities for stakeholders to give feedback and to understand their concerns through an ongoing dialogue; and

- Consider and, where possible, incorporate stakeholder feedback.

8.2.2 FEI Has Identified Stakeholders for Public Consultation

As part of its Consultation and Engagement Plan, FEI has and will continue to consult with the following stakeholders:

- Municipalities including:
  - City of Abbotsford
  - City of Coquitlam
  - City of Delta
  - City of Port Moody
  - City of Richmond
  - City of Surrey
  - City of Vancouver
  - Township of Langley
  - Village of Anmore
- FEI's customers;
- Residents and businesses along the rights of way;
- Residents and businesses nearby the rights of way and worksites; and
- Permitting authorities (see Section 8.2.5.5).

8.2.3 FEI Has Used Appropriate Communication Materials to Support Consultation

As described further below, FEI relies on a number of communication materials and methods to carry out its consultation activities. Due to the nature of the Project, the impacts will be substantially limited to those living and working near sites where work is planned, which are spread across a number of communities in the Lower Mainland. As such, FEI's communication materials primarily focus on providing transparent and accurate information to residents and businesses adjacent to the rights of way, and those nearby the rights of way and worksites. Communication materials will be updated as required throughout the Project's development.

For the purposes of communicating with the stakeholders (as set out in Section 8.2.2), the project is publicly referred to as the "Transmission System Upgrades" (TSU) Project, rather than the "Transmission Integrity Management Capacity" (TIMC) Project, used in this Application. FEI selected TSU for its public communications as it is simple, concise and easy to understand.

Project Webpage

FEI created a dedicated project webpage on FEI's "Talking Energy" website[71] which provides an overview of the Project, including a high-level map showing all project sites and detailed maps of two municipalities where there is a concentration of work. The webpage also provides transparent, clear, accurate and easily accessible project information to support consultation efforts and solicit feedback. The webpage went live on October 15, 2020. Between October 15 and January 31, 2021, 353 people visited the webpage. Website screenshots are provided in Appendix J-3. FEI will continue to update the Project webpage with the latest information, and monitor web traffic to the webpage.

Mail Notifications

Beginning on October 20, 2020, a total of ten project information letters were distributed to residents and businesses along the Project rights of way and approximately 210 project information letters were distributed to residents and businesses nearby the rights of way and worksites. The notification letter was also sent to two Property Managers to circulate to approximately 140 residences in multi-unit complexes on Cape Horn Avenue in Coquitlam and on East Kent Avenue in South Vancouver. Project information letters provided information about the proposed work, including a link to the project webpage, phone number and email address details in case residents or businesses wanted to learn more, ask questions or provide feedback. The letters provided to residents and businesses along the rights of way were followed by phone calls from FEI representatives (as described in Section 8.2.5.2).

Email and Phone Line

A Project-specific phone number (604.592.7494) and email address (transmissionupgrades@fortisbc.com) were activated on October 15, 2020, encouraging stakeholders with questions or feedback to contact FEI directly. They are included in all FEI project communication materials. FEI continues to closely monitor the Project email address and phone line, answering questions and responding to queries as needed. Feedback that has been received to date is described further in Section 8.2.6.

Other FEI Communication Channels

FEI has and will continue to use other channels to communicate with affected stakeholders, including through FEI's Talking Energy newsletter and its various social media channels. On October 29, 2020, FEI sent a Talking Energy newsletter to 3,866 subscribers that included project information. The newsletter is provided in Appendix J-4. Stakeholders interested in the Project are encouraged to sign up through FEI's online subscriber centre to receive regular updates via FEI's newsletters.[72]

---

[71] https://talkingenergy.ca/project/transmission-system-upgrades.
[72] https://subscriptions.fortisbc.com/subscribe.

Customer Notifications

FEI will notify all gas customers of the Project, including associated rate impacts, using a number of communication methods including bill inserts, the Accounts Online payment portal and as part of e-bill emails, FEI's website, and/or the Project webpage. FEI is in the process of notifying customers about associated rate impacts. Residential and small business gas customers will receive notifications in February 2021, with all remaining gas customers receiving notifications shortly thereafter.

8.2.4 FEI's Consultation Approach Reflects Community, Social and Environmental Considerations

Community, social and environmental considerations, along with the nature of the work planned, have helped guide the Consultation and Engagement Plan. To help mitigate potential adverse impacts of project construction, FEI will continue to proactively communicate with stakeholders about the Project, and undertake the consultation and mitigation measures outlined in Table 8-1 below. Further, FEI will:

- Require construction contractor(s) to develop and execute a Public Impact Mitigation Plan, which will outline strategies to minimize community impacts. The Public Impact Mitigation Plan will help ensure that impacts, such as noise, access, dust, and visual impacts, are minimal; and
- Ensure all construction activities are carried out in compliance with municipal noise by-laws.

Table 8-1: Public Impacts and Consultation and Mitigation Measures

Work Location and Event ID	Public Impact Identified	Consultation Method and Mitigation
City of Coquitlam: • Located at Lougheed Highway, close to Golden Drive • Work will take place within existing right of way. The work location to the east is close to two Industrial businesses.	• Industrial businesses may see an increase in construction traffic and noise.	• Businesses will be notified ahead of scheduled work. FEI will work with the construction contractor to ensure access is maintained at all times.

Work Location and Event ID	Public Impact Identified	Consultation Method and Mitigation
City of Coquitlam: • Located on David Avenue, close to Verbana Avenue and next to the Coquitlam Crunch Hiking Trail • Work will take place within a city street and existing right of way. It is in close proximity to a residential neighborhood and popular hiking trail.	• Surrounding residents may experience an increase in noise from heavy machinery. • Trail users may experience rerouting of access points. • Traffic may be rerouted.	• Notifications will be distributed ahead of work, and FEI will work with its contractor(s) to minimize impacts to the community, including noise. • FEI will consult with affected stakeholders throughout the project lifecycle, including project planning, and construction and restoration. • Signage will be displayed at access points of the walking trail where there may be impacts. Signage will reiterate FEI is committed to public safety.
City of Coquitlam: • Located on a right of way close to Cape Horn Avenue • Work will take place along an existing right of way that is within proximity to a popular recreational area for nearby residents.	• Residents may experience an increase in noise and construction traffic. • A section of the recreational space will be fenced off and not available for public use during construction.	• Notifications will be distributed ahead of work, and FEI will work with its contractor(s) to minimize impacts to the community, including noise. • Signage will be displayed within this area, where access or use may be restricted, and surrounding residents will be consulted prior to construction occurring.
City of Delta: • Located on River Road • Work will take place along an existing right of way within an industrial area.	• Industrial businesses may see an increase in construction traffic and noise.	• Businesses will be notified ahead of scheduled work. FEI will work with the construction contractor to ensure access is maintained at all times.
City of Delta: • Located on farmland within rights of way close to 72 Street • Work will take place close to Burns Bog.	• Burns Bog is an environmentally sensitive area (as identified in Section 7).	• FEI will consult directly with the landowners via email/phone. • FEI will consult with the City of Delta's Bog Specialist regarding this work.
Township of Langley: • Located on right of way close to 232 Street at 80 Avenue	• FEI requires access to the site through two private properties. • These residents may experience an increase in noise due to construction traffic and equipment. • Residents may notice FEI crews accessing the site via their property.	• FEI will consult directly with the landowners regarding this work via mail/phone to address impacts or concerns that arise.

Work Location and Event ID	Public Impact Identified	Consultation Method and Mitigation
FEI Facilities Work (Refer to Section 5, Tables 5-6 and 5-9) • City of Abbotsford • City of Coquitlam • City of Delta • City of Port Moody • City of Richmond • City of Surrey • City of Vancouver • Township of Langley • Village of Anmore The work will take place within existing FEI facilities.	• Surrounding residents and businesses may experience an increase in noise and construction traffic.	• FEI will notify the community throughout the project lifecycle regarding this work, including project planning and construction, and will work with its contractor(s) to minimize noise and traffic impacts throughout construction.

8.2.5 FEI Has Undertaken Appropriate Public Consultation Activities to Date

The following sections provide a summary of FEI's consultation activities with stakeholders including concerns and questions that have been raised, how FEI has responded to these to date, and its plan for addressing concerns and questions during the Project execution phase. FEI will continue to track consultation and corresponding feedback received from stakeholders as the Project progresses.

8.2.5.1 *Consultation to Date with Municipalities*

On October 1, 2020, FEI began consultation activities by emailing a project information letter to the nine municipalities where project work is planned, as set out above in Table 8-1. This introductory letter provided a project overview and associated maps of proposed works, which were based on a preliminary scope of work. As the Project developed, subsequent consultation activities occurred using the current project scope. An example of a letter to a municipality is provided as Appendix J-5.

FEI's consultation log (Appendix J-2) sets out a summary of feedback received during meetings, as well as presentations and correspondence with the public and municipalities. FEI contacted all of the impacted municipalities following the distribution of the project information letter. Municipalities were asked if they had any questions or concerns and were offered a virtual presentation to further clarify project scope. Three municipalities participated in virtual follow-up meetings. No concerns or issues were expressed during any of these meetings, summaries of which are also included in Appendix J-2. Follow-up meetings and communication will continue with these municipalities and more detailed information, including detailed engineering drawings, will be shared when available.

8.2.5.2 *Consultation to Date with Residents and Businesses Along the Rights of Way*

As discussed in Section 8.2.3, FEI started consultation with residents and businesses along the rights of way in October 2020. On October 21, 2020, three residents and seven businesses along the rights of way and in direct proximity to worksites were mailed project information letters. A copy of the letter to property owners along the right of way is included as Appendix J-6.

Follow-up telephone calls were made to affected residents and businesses on October 29 and October 30, 2020, confirming they received the letter, gathering feedback and addressing any outstanding concerns. The residents and businesses contacted have not raised any concerns at this stage. Feedback received is included as part of the consultation log (Appendix J-2). FEI will continue to consult with residents and businesses along the rights of way throughout the lifecycle of the Project.

8.2.5.3 *Consultation to Date with Residents and Businesses nearby the Rights of Way and Worksites*

Between October 20 and October 30, 2020, project information letters were distributed to approximately 210 residents and businesses nearby the rights of way and worksites. Two property management companies also distributed project information letters to approximately 140 additional residences. As per Section 8.2.3, the letters provided project information, notification of FEI's intent to file an application with the BCUC, and contact information for stakeholders to ask questions and provide feedback. A copy of the letter is included as Appendix J-7.

FEI received two responses to the Project information letter. The responses are included in the consultation log (Appendix J-2) and are discussed in more detail in Section 8.2.6 below. Feedback received throughout consultation has been, and will continue to be, incorporated into project plans.

In consideration of COVID-19 protocols, project information letters were primarily distributed through direct mail or emailed to property management companies for distribution to residents. A limited number of letters were also hand delivered, with no personal contact with residents.

8.2.5.4 *Consultation to Date with Customers*

FEI began sharing information with customers in October 2020. As outlined in Section 8.2.3, a Talking Energy newsletter with project information was emailed to 3,866 subscribers on October 29, 2020. The newsletter is distributed on a quarterly basis to individuals who subscribe through FEI's online subscriber centre.[73]

[73] https://subscriptions.fortisbc.com/subscribe.

Further consultation activities are planned for 2021 including additional information about the Project and its associated rate impacts. For example, FEI will be distributing a bill insert to all residential and small business gas customers in February 2021, and all remaining gas customers shortly thereafter. FEI is also planning to share project information via FEI's various social media channels.

8.2.5.5 *Consultation to Date with Permitting Agencies*

FEI has undertaken meaningful engagement with permitting agencies, including: Metro Vancouver, Trans Mountain, BC Hydro, TELUS and Canadian Pacific Railway. Consultation with these permitting agencies to date can be found in the stakeholder consultation log (Appendix J-2).

8.2.6 FEI Has Responded to Issues and Concerns Raised by Customers, Residents, Businesses and Stakeholder Groups

FEI has been open and transparent in its consultation and communication with stakeholders, including proactively discussing project details, and addressing questions that arise in a timely manner. Two questions were raised by residents using the dedicated project phone line, which are detailed in Table 8-2 below.

Table 8-2: Issues & Concerns Raised Through Public Consultation

Inquiry	Description of issue	FEI's response
Noise and construction impacts	November 3, 2020 – A resident on Pinnacle Avenue (Coquitlam) called the Project information phone line expressing concern for future noise and construction impacts.	FEI informed the resident that it will be working with its contractor(s) prior to construction commencing in order to minimize construction impacts, including noise. FEI also committed to providing further information, prior to commencing construction activities.
Inquiry about a new gas line	November 5, 2020 – A resident living close to Noons Creek Facility (Coquitlam) called the Project information line and enquired if a new gas line was required in the area.	FEI informed the resident that the work is within FEI's facility and does not include a new gas line in the area. FEI will update residents as the Project progresses. The resident appreciated FEI's response and had no further questions.

8.2.7 Future Consultation and Communication Plan

FEI believes the consultation and communication activities at the time of filing the Application have been sufficient, appropriate and reasonable. FEI will continue to consult with stakeholders regarding construction timelines, scope of work, safety and mitigation plans. In an effort to minimize impacts, further consultation will continue prior to and throughout construction, to help inform stakeholders about construction activities in their area.

FEI is committed to providing updates and proactively communicating with stakeholders in order respond to concerns throughout the Project lifecycle and will continue to:

- Communicate with municipalities through meetings, presentations, information letters, phone calls and emails throughout the Project lifecycle;
- Communicate project information to FEI's gas customers as needed through FEI's various platforms including: the Talking Energy webpage, e-newsletters, social media channels, advertising and news media outreach;
- Communicate with residents and businesses along the rights of way through meetings, information letters, phone calls and emails throughout the Project lifecycle; and
- Communicate with residents and businesses nearby the rights of way and worksites through meetings, project information letters, phone calls and emails throughout the Project lifecycle.

FEI is not aware of any outstanding concerns and is committed to responding to the feedback received from stakeholders as the Project continues to develop.

8.3 *FEI IS ENGAGING WITH INDIGENOUS GROUPS*

Since October 2020, FEI has engaged with Indigenous groups through a transparent, frequent, two-way dialogue, which has allowed for the early identification of issues, concerns and shared interests, and has focused engagement activities on finding mutually agreeable solutions. FEI's 'Statement of Indigenous Principles'[74] informs its approach to engagement (Appendix K-1). FEI seeks to build and maintain relationships with Indigenous groups across the province and will continue to be guided by its core principles throughout the lifecycle of the Project. This approach to engagement ensures that the potential impacts of the Project on the title, rights and interests of affected Indigenous communities are documented and considered.

The subsections below are organized around the following points:

- Section 8.3.1: FEI has adopted an engagement approach with Indigenous groups that is thorough, timely and meaningful.
- Section 8.3.2: Using the Government of BC's Consultative Area Database (CAD), FEI has identified 25 Indigenous groups potentially affected by the Project.
- Section 8.3.3: FEI initiated engagement on October 2, 2020. FEI will continue to engage with potentially affected Indigenous groups while respecting COVID-19 safety measures and capacity constraints as Indigenous groups address the pandemic.
- Section 8.3.4: Overall response to engagement has been neutral. FEI will continue to track, monitor and address issues, and identify interests and/or issues raised by Indigenous groups.

[74] https://www.fortisbc.com/in-your-community/indigenous-relations/statement-of-indigenous-principles.

- Section 8.3.5: FEI has made sufficient and appropriate efforts to engage Indigenous groups to date.
- Section 8.3.6: FEI will continue engagement with the 25 Indigenous groups through follow-up virtual meetings, information sharing and letters/emails. This includes advising the Indigenous groups when FEI files the Application.

8.3.1 FEI's Engagement Approach is Appropriate

FEI is committed to thorough, timely and meaningful engagement with Indigenous groups and has taken this approach in developing its Consultation and Engagement Plan for the Project (Appendix J-1). In October 2020, FEI initiated early engagement activities that included an emailed project information letter, as well as preliminary maps and reports (these activities are described further in Section 8.3.3). FEI will to keep potentially affected Indigenous groups informed about the Project as it advances and will provide capacity funding to interested Indigenous groups in order to facilitate engagement activities.

FEI's approach to engagement also reflects the impact of COVID-19 on the capacity of Indigenous communities to respond and review information, and the importance of offering virtual engagement opportunities. FEI has ensured a minimum of 45 days were available for Indigenous groups to review materials, and that all correspondence was through email, phone, or video conference.

While the constitutional duty to consult with Indigenous groups rests with the Crown, FEI's Indigenous engagement activities will aid the appropriate Crown agencies in meeting that duty. FEI's goal is to incorporate feedback from Indigenous groups throughout the Project lifecycle, including Project planning (particularly the BCOGC permitting processes), construction and restoration. FEI is committed to working with responsible Crown agencies, such as the BCOGC, to identify, avoid and mitigate potential impacts on Indigenous title, rights and interests and, when appropriate, to discuss and develop options for mitigation and/or accommodation.

8.3.2 FEI has Identified Indigenous Groups Potentially Affected

FEI developed a list of Indigenous groups with asserted interests to engage regarding the Project using information from the BC Government's CAD. Through this query, FEI identified 25 Indigenous groups, as per the Spatial Overview Engine (SOE) Reports queried on September 29, 2020 (Appendix K-2). FEI's early engagement efforts and SOE query were based on the preliminary project scope. On October 23 2020, FEI performed a second query based on the refined project scope and validated that the list of 25 potentially affected Indigenous groups was complete.

In Table 8-3 below, FEI provides the Indigenous groups with asserted interests identified through the CAD.

Table 8-3: Consultative Area Database Query Indigenous Groups (in alphabetical order)

Indigenous Groups	
Cowichan Tribes	Seabird Island Band
Halalt First Nation	Semiahmoo First Nation
Katzie First Nation	Shxw'ow'hamel First Nation
Kwantlen First Nation	Skawahlook First Nation (via PRRO)
Kwikwetlem First Nation	Soowahlie First Nation (via PRRO)
Lake Cowichan First Nation	Squamish Nation
Leq'á:mel First Nation	Stó:l? Tribal Council (via PRRO)
Lyackson First Nation	Stó:l? Nation (via PRRO)
Matsqui First Nation	Sumas First Nation (via PRRO)
Musqueam Indian Band	Stz'uminus First Nation
Penelakut Tribe	Tsawwassen First Nation
People of the River Referrals Office (PRRO)	Tseil-Waututh Nation
Peters First Nation	

8.3.3 FEI's Engagement with Indigenous Groups to Date

On October 2, 2020, FEI initiated early engagement with Indigenous groups. As described in Section 8.3.1, early engagement activities consisted of an emailed Project information letter and maps that were based on the preliminary project scope. FEI's subsequent engagement reflects the refined project scope.

On November 6, 2020, FEI sent follow-up letters to the 25 Indigenous groups. The letters (Appendix K-3) included a copy of the EOA (Appendix H) and ACR (Appendix I), and maps reflecting updates to the proposed Project work sites. FEI has offered to schedule virtual meetings with Indigenous groups to review Project details to respond to any questions or concerns about the Project. FEI has also followed up on questions from Indigenous groups either by email, phone, or through virtual meetings. Key engagement activities are listed below in Table 8-4, while a complete log of engagement with applicable Indigenous groups is included in Appendix K-4.

Table 8-4: Indigenous Groups Key Engagement Activities

Format	Date	Indigenous Group	Content
Emailed document	October 2, 2020	All Indigenous groups identified in Table 8-3	• Project information letter • Map of work locations
Emailed document	November 6, 2020	All Indigenous groups identified in Table 8-3	• Updated map of work sites • EOA • ACR

Format	Date	Indigenous Group	Content
Virtual meeting	Upon request by an Indigenous group	Matsqui (November 19 and December 3, 2020), PRRO (December 3, 2020) and Cowichan Tribes (January 18, 2021)	• Project overview PowerPoint presentation

On December 3, 2020, FEI hosted virtual meetings with Matsqui First Nation (MFN) and the People of the River Referrals Office (PRRO). The meetings provided opportunities for FEI to review the Project with representatives from the respective Indigenous groups and to discuss interests, issues, and concerns (which are summarized below in Section 8.3.4, Table 8-5).

8.3.4 FEI has Responded to Issues and Interests Raised by Indigenous Groups

At the time of filing, Indigenous groups have not expressed any concerns regarding the Project. Engagement activities have primarily focused on information sharing and Indigenous involvement on the Project. Table 8-5 provides a summary of questions, issues and concerns raised by Indigenous groups. A complete log of engagement with Indigenous groups is included in Appendix K-4.

Table 8-5: Questions, Issues, and Concerns by Indigenous Groups

Indigenous Group	Summary of questions, issues or concerns	Next Steps/follow-up
Tsleil-Waututh Nation (TWN)	• **October 6, 2020:** TWN sent a copy of their Stewardship Policy and confirmed 45 day review period. • **December 17, 2020:** TWN sent cost estimate for review of EOA and ACR. • **January 19, 2020:** TWN reviewed Archaeological Constraints Report and requested that FEI and its consultants apply for TWN archaeological permits for each work sites rather than one permit for the entire project. TWN notified that, due to internal capacity, they are delayed in reviewing the EOA.	• FEI has accepted the cost estimate for TWN to review materials. FEI has noted the request for multiple permits and will work with archaeological consultants to obtain permits. FEI is awaiting comments on the EOA and will continue to engage TWN to address any interests or concerns.

Indigenous Group	Summary of questions, issues or concerns	Next Steps/follow-up
People of the River Referrals Office (PRRO)	• **October 8, 2020:** Requested geospatial data. FEI provided KMZ file of worksites. • **November 30, 2020:** PRRO provided Technical Review on FEI's application which indicated some worksites may potentially impact waterways and cultural and heritage sites. • **December 3, 2020:** FEI hosted virtual meeting with PRRO to discuss Technical Review and PRRO's interests in the Project. • **January 18, 2021:** PRRO sent final engagement report in which they request FEI send reports related to watercourses and environmental impacts as they become available through the life of the Project.	• FEI will continue to keep PRRO informed about the Project as it develops and share documents in advance of further archaeological and environmental assessments and construction activities as PRRO requested on January 18, 2021.
Matsqui First Nation (MFN)	• **October 9, 2020:** MFN requested additional information about the Project. MFN indicated an interest in training opportunities and to have their own monitors present for project activities. • **October 14, 2020:** FEI hosted a telephone meeting to discuss the Project. • **November 19 and December 3, 2020:** FEI hosted a follow-up virtual meeting with MFN to review project details, EOA and ACR, further clarify the request for monitors and training, and respond to any further questions, concerns and interests.	• FEI is planning additional meetings with MFN to continue discussions about their interests in the Project.
Kwikwetlem First Nation (KFN)	• **October 27, 2020:** KFN indicated an interest in capacity funding to participate in engagement.	• FEI followed-up with KFN to discuss capacity funding.
Musqueam Indian Band (MIB)	• **November 13, 2020:** Follow-up email to inform MIB about anticipated work in the Delta area.	• FEI will continue to update MIB about the Project as it develops and in advance of further archaeological and environmental assessments and construction activities.
Squamish Nation (SN)	• **November 10, 2020:** SN invited FEI to upload project materials to Squamish Connect referrals portal. • **November 24, 2020:** SN requested spatial data.	• FEI provided KMZ files through Squamish Connect.
Cowichan Tribes (CT)	• **December 11, 2020:** CT notified FEI of their review of the EOA and ACR. CT requested that they be engaged on future archaeological activities at Tilbury and Richmond worksites. • **January 18, 2021:** FEI hosted virtual meeting with CT to discuss the Project and their interests in archaeological activities.	• FEI will continue to send archaeological reports to CT for review and comment. FEI will continue to engage CT on archaeological interests.

8.3.5 FEI's Indigenous Engagement Efforts to Date Have Been Appropriate

FEI has initiated meaningful, clear and transparent engagement with the Indigenous groups identified as having an interest in the Project area, reflecting its Statement of Indigenous Principles (see Appendix K-1). To date, engagement activities have introduced the Project by sharing maps, preliminary reports, and information regarding construction timelines and the scope of work. All engagement activities and correspondence have been appropriately logged and included in the appendices to this Application.

FEI has established key points of contact with Indigenous groups potentially affected by the Project, their preferred methods of communication, and an early understanding of their interests and concerns (as applicable). As the Project advances, engagement with Indigenous groups will continue. Section 8.3.6 below describes some of the additional engagement activities FEI plans to undertake. These efforts are consistent with FEI's dedication to maintaining an open dialogue and positive relationships with Indigenous groups.

8.3.6 FEI Will Continue to Engage with Indigenous Groups

FEI will continue providing detailed Project information to the 25 Indigenous groups identified for their consideration and comment. Further engagement will take place throughout the Project's lifecycle, including project planning, construction and restoration. In particular, FEI is committed to:

- Engaging Indigenous groups during the permitting process (particularly as part of the BCOGC permitting process), sharing relevant documents (e.g., Environmental Management Plans), and sending periodic Project updates;
- Communicating and soliciting feedback regarding construction timelines, scope of work, and safety and mitigation plans. This includes, in particular, working with Indigenous groups in advance of completing an Archaeological Overview Assessment (AOA) and Archaeological Impact Assessment (AIA) by, for example, obtaining relevant Indigenous-issued permits and sharing results for assessment review and comment (see Section 7.3); and
- Notifying Indigenous groups once the Application is filed with BCUC.

As the Project progresses, FEI will support Indigenous engagement activities through capacity funding and will reach out to Indigenous groups during the procurement process to identify employment and contract opportunities.

8.4 *CONCLUSION*

FEI has consulted with and sought feedback from all Project stakeholders and Indigenous groups during the pre-submission phase of the Project. FEI's consultation and engagement has been sufficient to date. FEI has recorded questions, issues, and concerns from Project stakeholders and Indigenous groups and will continue engaging with these groups by keeping lines of communication open as the Project advances. FEI will continue to work with stakeholders, and Indigenous groups to address any outstanding interests and issues throughout the lifecycle of the Project, including planning, construction and restoration.

9. PROVINCIAL GOVERNMENT ENERGY OBJECTIVES AND LONG TERM RESOURCE PLAN

9.1 INTRODUCTION

This section discusses the factors that section 46(3.1) of the UCA[75] states the BCUC must consider when determining whether to issue a CPCN:

(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,[76] as referred to in subsection (c) above, do not apply to FEI. FEI addresses the other two requirements below.

9.2 BRITISH COLUMBIA'S ENERGY OBJECTIVES

The Project will support the British Columbia energy objective in section 2(k) of the CEA "to encourage economic development and the creation and retention of jobs." The Project will support this objective by creating jobs and contributing to the local economy. The Project will create jobs in BC through FEI's contractors, and result in the procurement of goods and services from locally-owned and operated vendors and subcontractors. FEI also anticipates an increase in the use of local services, such as dining, lodging accommodations and other services, during construction will benefit the economy.

FEI is committed to working with Indigenous groups, community leaders and local organizations, developing the local workforce, supporting local businesses, and connecting them to Project opportunities. For example, to promote Indigenous and other local participation in the Project, FEI will host business-to-business and worker-to-business networking events. These events would facilitate introductions between Indigenous and other local business owners, members of the local workforce, and connect them to contract and employment opportunities.

9.3 LONG TERM RESOURCE PLAN

The Project is described in Section 6.4 of FEI's most recent 2017 Long Term Gas Resource Plan (LTGRP) filed with BCUC.[77] As mentioned in the 2017 LTGRP, the implementation of the EMAT technology may necessitate:

[75] https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96473_01.
[76] https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/10022_01.

- Alterations of the sending and receiving barrels to accept the newer tools;
- Alterations to the transmission pipelines so that the new tools can traverse them without hindrance or interruption to ensure successful data collection; and
- The installation of flow control equipment and/or transmission loops to facilitate the control (i.e., reduction) of the gas flow velocity in order to ensure successful data collection.

In addition, FEI noted in the 2017 LTGRP that the initial scope of this activity would focus on older pipeline systems in the CTS and ITS that are ILI capable.

The CTS TIMC Project focusses on the CTS pipeline system and remains consistent with the 2017 LTGRP. As noted in Section 3.4, FEI is currently investigating EMAT technology for the ITS gas pipelines and plans to implement it in future CPCN applications.

9.4 *CONCLUSION*

In summary, the Project is consistent with British Columbia's energy objectives and FEI's long-term gas resource plan in a number of respects. These factors support the approval of the Project.

[77] https://www.bcuc.com/ApplicationView.aspx?ApplicationId=617

10. CONCLUSION

The CTS TIMC Project is in the public interest, as it is the most cost-effective way for FEI to mitigate the identified cracking risk to 11 CTS pipelines. FEI has prudently responded to changing industry knowledge and practice related to cracking by conducting an assessment of the susceptibility of its own pipelines to cracking and quantitative assessment of the relative risk that cracking poses to its system. FEI's assessments have shown that 11 of its CTS pipelines are susceptible to cracking, that at the system level safety risk is greatest for the CTS, and that cracking is the greatest contributor to the safety risk of the CTS. Therefore, the Project correctly prioritizes work on the CTS to make the 11 susceptible pipelines ready for EMAT ILI tools, which will allow FEI to monitor and mitigate cracking threats. EMAT ILI tools are the only technically and financially feasible option for mitigating the identified cracking risk and are becoming the standard industry practice for mitigating cracking risk on pipelines of this size.[78] Given the potential significant consequences of not addressing cracking threats, FEI's obligations to ensure safe and reliable operations of its assets compel FEI to undertake the Project.

FEI has appropriately planned and defined the Project, will be mitigating environmental and archaeological impacts, and will continue to consult and engage with stakeholders and Indigenous communities.

The Company requests that the BCUC approve the Project as set out in the Application.

[78] As described in Section 4.7, FEI considers that PRS is the most cost effective way to meet the Project Objective for a segment of Cape Horn to Burrard 508 transmission pipeline.

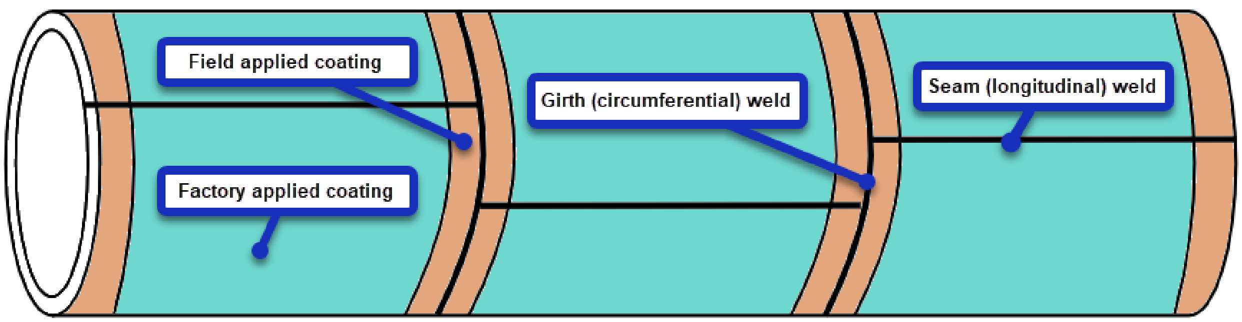
Appendix A

EXAMPLES OF NON-SCC CRACKING

EXAMPLES OF CRACK-LIKE IMPERFECTIONS IN SEAM WELDS

Crack and crack-like imperfections are typically associated with the seam (longitudinal) weld of a pipeline that is formed during the manufacturing process. During manufacturing, the two edges of a sheet of steel are joined, creating a seam weld, to form the cylindrical pipe. As described in Section 3.2.4.2, the welding processes used to form the seam weld during manufacturing can result in several crack and crack-like imperfections. These imperfections are generally considered stable in natural gas pipelines if they have survived the mill test and pre-commissioning hydrostatic test. However, if these manufacturing imperfections occur in conjunction with other integrity threats, such as corrosion or dents, they may grow to failure.

Figure 1: Typical Pipeline Features



Imperfections Associated with Seam Welds Formed by Electric Resistance Welding (ERW)

Some imperfections associated with seam welds formed by ERW include:

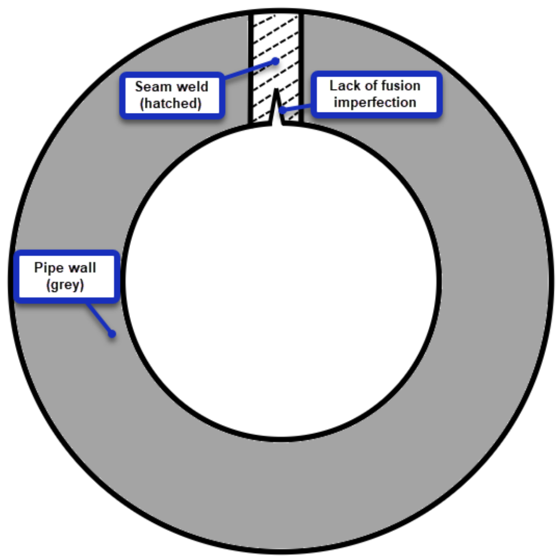
(a) Lack of fusion
(b) Hook cracks
(c) Selective seam weld corrosion

These imperfections can occur on both the inside or outside surfaces of the weld. A description of each is provided in the following sections.

(a) Lack of Fusion

Lack of fusion results when the abutting edges of the pipe at the weld only partially bond. This can be a result of contamination of the bond surfaces or the weld process itself. These “crack-like” planar imperfections are more prevalent in pipe manufactured using low frequency ERW as compared to high frequency ERW.

Figure 2: Example of a Lack of Fusion Imperfection



(b) Hook Cracks

Non-metallic inclusions can be present in the steel used to manufacture pipe. Non-metallic inclusions are chemical compounds such as sulfides and oxides. When steel is rolled out to form the strip used to make the pipe, inclusions can be flattened and extended to form laminations. As shown in Figure 3, laminations are subsurface separations that are typically parallel to the surface of the pipe. Laminations typically occur near the mid-wall of the pipe and stay within the steel, but can occasionally slope and break the surface of the steel. Surface breaking laminations effectively reduce the wall thickness of the pipe in the area of the lamination. Non-surface breaking laminations are typically considered benign except when they have occurred at the edge of the steel sheet being used to form the pipe. However, as pressure is applied during the creation of the seam weld, laminations can be pushed to the surface, forming a J-shaped crack known as a hook crack (shown in Figure 4).

Figure 3: Example of a Non-Surface Breaking Lamination in a Steel Plate

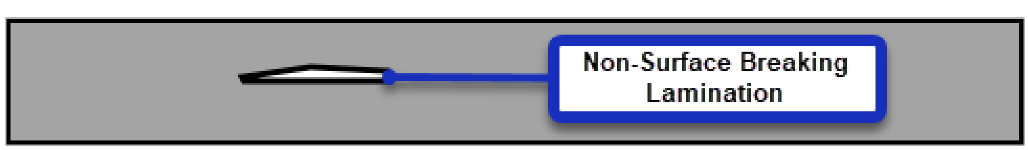
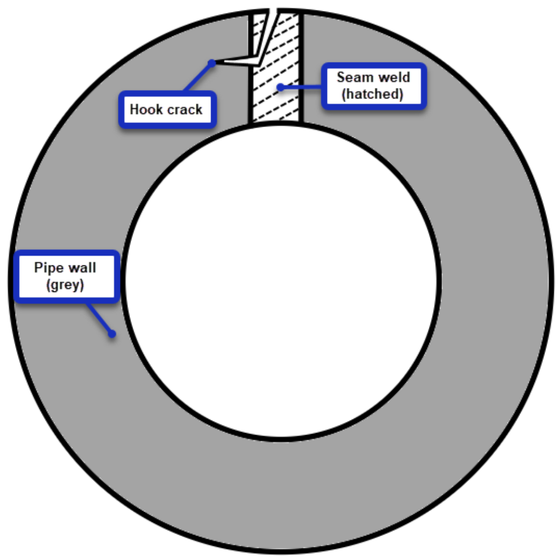


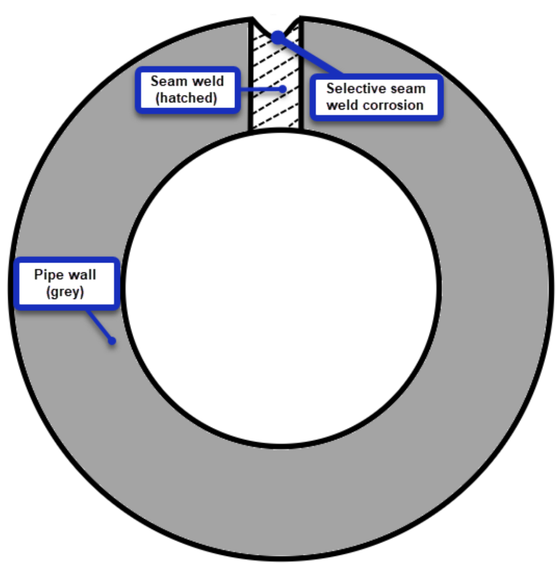
Figure 4: Example of a Hook Crack



(c) Selective Seam Weld Corrosion

Although not a manufacturing imperfection, some ERW seam weld materials are also susceptible to a phenomenon known as selective seam weld corrosion or “grooving” corrosion, where corrosion preferentially attacks the bondline region of the weld at a higher rate than the surrounding material. Due to the higher rate of corrosion this can result in failure sooner than corrosion in the parent material comprising the rest of the pipe wall. Since the bondline region in older ERW materials is not as tough as the parent material, it is more likely to fail as a rupture should sufficient penetration occur.

Figure 5: Example of Selective Seam Weld Corrosion



Imperfections Associated With Seam Welds formed by Submerged Arc Welding (SAW)

Unlike ERW, the SAW process leaves slight protrusions at the inside and outside surfaces of the seam weld. As a result, protrusions on the external surface can cause challenges with some pipe coating systems. Tape coatings[1], which are commonly used to protect the pipeline from corrosion and surface damage, can pull away from the pipe and create a tent-like void along the length of the seam weld. If moisture gets between the coating and the pipe, and the pipe is experiencing CP shielding[2], corrosion known as narrow axial inline corrosion (NAIC) can occur. Corrosion, in conjunction with other manufacturing imperfections, can lead to a pipeline failure at pressures lower than expected for the metal loss by itself.

Some imperfections associated with seam welds formed by SAW include:

(a) Toe cracks
(b) Transit fatigue

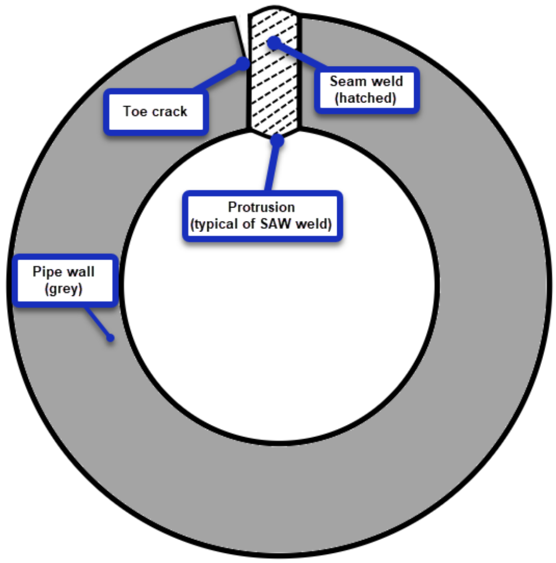
A description of each is provided in the following sections.

(a) Toe Cracks

Toe cracks are the most common seam weld imperfection found in SAW pipe. These cracks occur post-welding, at the edge or "toe'" of the weld causing it to become a stress raiser.[3] Toe cracks also typically occur at locations where non-metallic inclusions are present in the steel and can occur on either surface of the pipe.

[1] Tape coatings are applied by wrapping a coating material around the circumference of the pipeline along its entire length.
[2] CP shielding prevents the CP current from reaching the pipeline and contributes to a corrosive environment where corrosion and/or cracking may initiate and grow.
[3] As per Canadian Energy Pipeline Association (CEPA), a stress raiser is defined as "a discontinuity, such as a crack, gouge, notch, or geometry change that causes an intensification of the local stress."

Figure 6: Example of a Toe Crack



(b) Transit Fatigue

Transit fatigue is cracking that can occur on vintage SAW pipeline. Fatigue cracks can occur from repeated stresses from bouncing and shaking during pipe transport, especially if the pipe is inadequately supported. It is more likely to occur on pipe that is shipped by rail, but can occur on pipe shipped by truck or ship. This type of cracking most commonly occurs at the toe of the seam weld on SAW pipe on both the internal and external surfaces of the pipe. As such, transit fatigue looks similar to a toe crack (see Figure 6).

Appendix B

JANA'S REPORTS

FILED CONFIDENTIALLY

Appendix B-1

ANALYSIS OF CRACKING THREATS IN FEI MAINLINE TRANSMISSION PIPELINES

FILED CONFIDENTIALLY

Appendix B-2

QUANITITATIVE SAFETY RISK ASSESSMENT OF FEI MAINLINE TRANSMISSION PIPELINES

FILED CONFIDENTIALLY

Appendix C

BC OGC RESPONSE LETTER TO FEI

BC Oil & Gas COMMISSION

November 16, 2020

BC UTILITIES COMMISSION
900 Howe Street
Vancouver, BC V6Z 2S9

Subject: TIMC Project Justification

As you are aware, FortisBC Energy Inc. (FEI) is a permit holder with the BC Oil and Gas Commission (Commission). As a permit holder, FEI has certain obligations to maintain its pipeline infrastructure to accord with legislative, regulatory and code requirements, including:

> *Oil and Gas Activities Act,* [SBC 2008], c. 36
>
> 37(1) A permit holder, an authorization holder and a person carrying out an oil and gas activity must
>
> (a) Prevent spillage, and
>
> …
>
> CSA Z662:19 Oil and gas pipeline systems (excerpts only)
>
> 10.3.2.2
>
> Where an engineering assessment, the operating company's integrity management program, or observation indicates that portions of the pipeline system are susceptible to failure, the operating company shall either implement measures preventing such failures or operate the system under conditions that are determined by an engineering assessment to be acceptable.

FEI has advised the Commission that it has identified integrity concerns as a result of its assessments that require additional action to maintain suitable continued service. The Commission understands that the Transmission Integrity Management Capabilities (TIMC) Project will be part of FEI's plan to address the identified integrity concerns. The Commission is supportive of FEI taking action to address its known integrity concerns and to ensure that it meets its requirements as a permit holder under the Oil and Gas Activities Act.

Sincerely,

Nicole Koosmann
Vice President, Engineering, Integrity & Technical Compliance

Appendix D

FEED REPORTS AND DOCUMENTS

FILED CONFIDENTIALLY

Appendix D-1

IN-LINE INSPECTION CRITERIA

FILED CONFIDENTIALLY

Appendix D-2

FEED REPORT DOCUMENTS

FILED CONFIDENTIALLY

Appendix D-3

BASIS OF SCHEDULE AND SCHEDULE REPORT DOCUMENTS

FILED CONFIDENTIALLY

Appendix D-4

BASIS OF ESTIMATE AND ESTIMATE REPORT DOCUMENTS

FILED CONFIDENTIALLY

Appendix E

RISK ANALYSIS

FILED CONFIDENTIALLY

Appendix E-1

PROJECT QUALITATIVE RISK ASSESSMENT REPORT

FILED CONFIDENTIALLY

Appendix E-2

PROJECT RISK REGISTER

FILED CONFIDENTIALLY

Appendix E-3

VALIDATION ESTIMATING CONTINGENCY REPORT

FILED CONFIDENTIALLY

Appendix E-4

VALIDATION ESTIMATING ESCALATION REPORT

FILED CONFIDENTIALLY

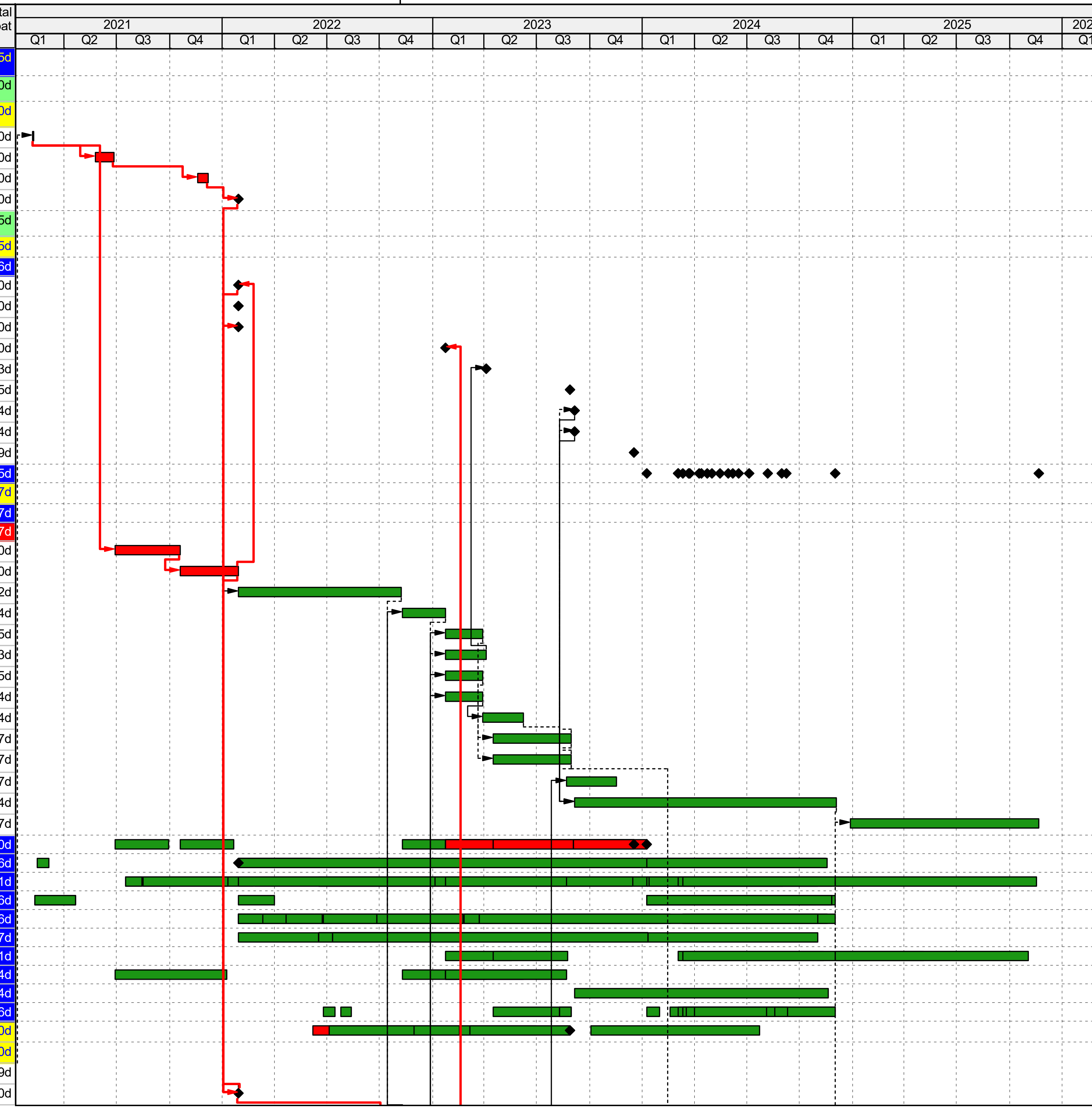
Appendix F

DETAILED SCHEDULE

Coastal Transmission System
Transmission Integrity Management Capability (CTS TIMC)
Master Schedule - CPCN

29-Jan-21 08:50

Activity ID	Activity Name	Start	Finish	Original Duration	Total Float
M-0002 Transmission Integrity Management Capability (TIMC) - Master Schedule -		30-Oct-20	20-Nov-25	1320d	15d
M-0002.2 CPCN Application		05-Feb-21	27-Jan-22	241d	0d
M-0002.2.A Application		05-Feb-21	27-Jan-22	241d	0d
TIMC-CPC-1000	CPCN Application	05-Feb-21*	05-Feb-21	1d	0d
TIMC-CPC-1010	Round 1 IRs	25-May-21*	25-Jun-21	24d	0d
TIMC-CPC-1020	Round 2 IRs	19-Nov-21*	06-Dec-21	12d	0d
TIMC-CPC-1030	CPCN Approval		27-Jan-22	0d	0d
M-0002.3 Capital Cost - Execution		30-Oct-20	20-Nov-25	1320d	15d
M-0002.3.4 Major Milestones		27-Jan-22	20-Nov-25	995d	15d
M-0002.3.4.2 Project Milestones		27-Jan-22	18-Dec-23	491d	16d
TIMC-MS-1000	Engineering Contract Award		27-Jan-22	0d	0d
TIMC-MS-1020	Communications/Engagement Start	28-Jan-22		0d	20d
TIMC-MS-1010	Detailed Design Phase Kickoff	28-Jan-22		0d	0d
TIMC-MS-1030	IFC Design Complete		24-Jan-23	0d	0d
TIMC-MS-1040	Fabrication Contract Award		05-Apr-23*	0d	63d
TIMC-MS-1070	Finalize Engineering for Procurement		28-Aug-23	0d	115d
TIMC-MS-1050	Pipeline Contract Award		05-Sep-23	0d	24d
TIMC-MS-1060	Facility Contract Award		05-Sep-23	0d	24d
TIMC-MS-1080	All Contracts Awarded		18-Dec-23	0d	19d
M-0002.3.4.1 Construction Milestones		09-Jan-24	20-Nov-25	488d	15d
M-0002.3.A Project Services		08-Feb-21	20-Nov-25	1249d	7d
M-0002.3.A.01 Project Management		28-Jun-21	20-Nov-25	1118d	7d
M-0002.3.A.01.01 Internal PM - FEI		28-Jun-21	20-Nov-25	1118d	7d
TIMC-PMI-1000	Prepare engineering contractor RFP	28-Jun-21	18-Oct-21	78d	0d
TIMC-PMI-1010	Engineering contractor bid, evaluation, and contractor selection	19-Oct-21	27-Jan-22	65d	0d
TIMC-PMII-1020	Review design deliverables from external consultants through to IFC	28-Jan-22	08-Nov-22	200d	2d
TIMC-PMI-1030	Prepare fabrication contractor RFP	10-Nov-22	23-Jan-23	45d	64d
TIMC-PMI-1040	Prepare construction contractor RFP for Pipeline	24-Jan-23	29-Mar-23	45d	15d
TIMC-PMI-1050	Fabrication contractor bid and contractor selection	24-Jan-23	05-Apr-23	50d	63d
TIMC-PMI-1060	Prepare construction contractor RFP for Facility	24-Jan-23	29-Mar-23	45d	15d
TIMC-PMI-1070	Prepare NDE service provider RFP	24-Jan-23	29-Mar-23	45d	84d
TIMC-PMI-1080	NDE service provider bid and selection	29-Mar-23	09-Jun-23	50d	84d
TIMC-PMI-1090	Construction contractor bid and contractor selection for Pipeline	17-Apr-23	30-Aug-23	95d	27d
TIMC-PMI-1100	Construction contractor bid and contractor selection for Facility	17-Apr-23	30-Aug-23	95d	27d
TIMC-PMI-1120	Prepare commissioning checklist	22-Aug-23	16-Nov-23	60d	77d
TIMC-PMI-1110	Manage PO's and Change orders for all main construction contractor until demob	05-Sep-23	03-Dec-24	320d	24d
TIMC-PMI-1130	Manage project closeout	27-Dec-24	20-Nov-25	235d	7d
M-0002.3.A.02 Contract Management		28-Jun-21	09-Jan-24	661d	0d
M-0002.3.A.03 Community Relations		12-Feb-21	18-Nov-24	981d	36d
M-0002.3.A.04 Indigenous Relations		16-Jul-21	17-Nov-25	1101d	11d
M-0002.3.A.05 Communications		08-Feb-21	02-Dec-24	961d	26d
M-0002.3.A.06 Environmental/Archaeology		28-Jan-22	02-Dec-24	741d	26d
M-0002.3.A.07 Regulatory/Permitting		28-Jan-22	31-Oct-24	700d	47d
M-0002.3.A.08 Property Services		24-Jan-23	03-Nov-25	713d	21d
M-0002.3.A.09 Legal		28-Jun-21	21-Aug-23	536d	34d
M-0002.3.A.10 Operations Support		05-Sep-23	19-Nov-24	310d	34d
M-0002.3.A.11 Health & Safety		24-Jun-22	02-Dec-24	616d	26d
M-0002.3.B Procurement		07-Jun-22	22-Jul-24	658d	80d
M-0002.3.C Engineering		30-Oct-20	24-Jan-23	660d	0d
TIMC-ENG-1000	FEED Complete	30-Oct-20*		0d	69d
TIMC-ENG-1010	Detailed Design Phase Kickoff	28-Jan-22		0d	0d

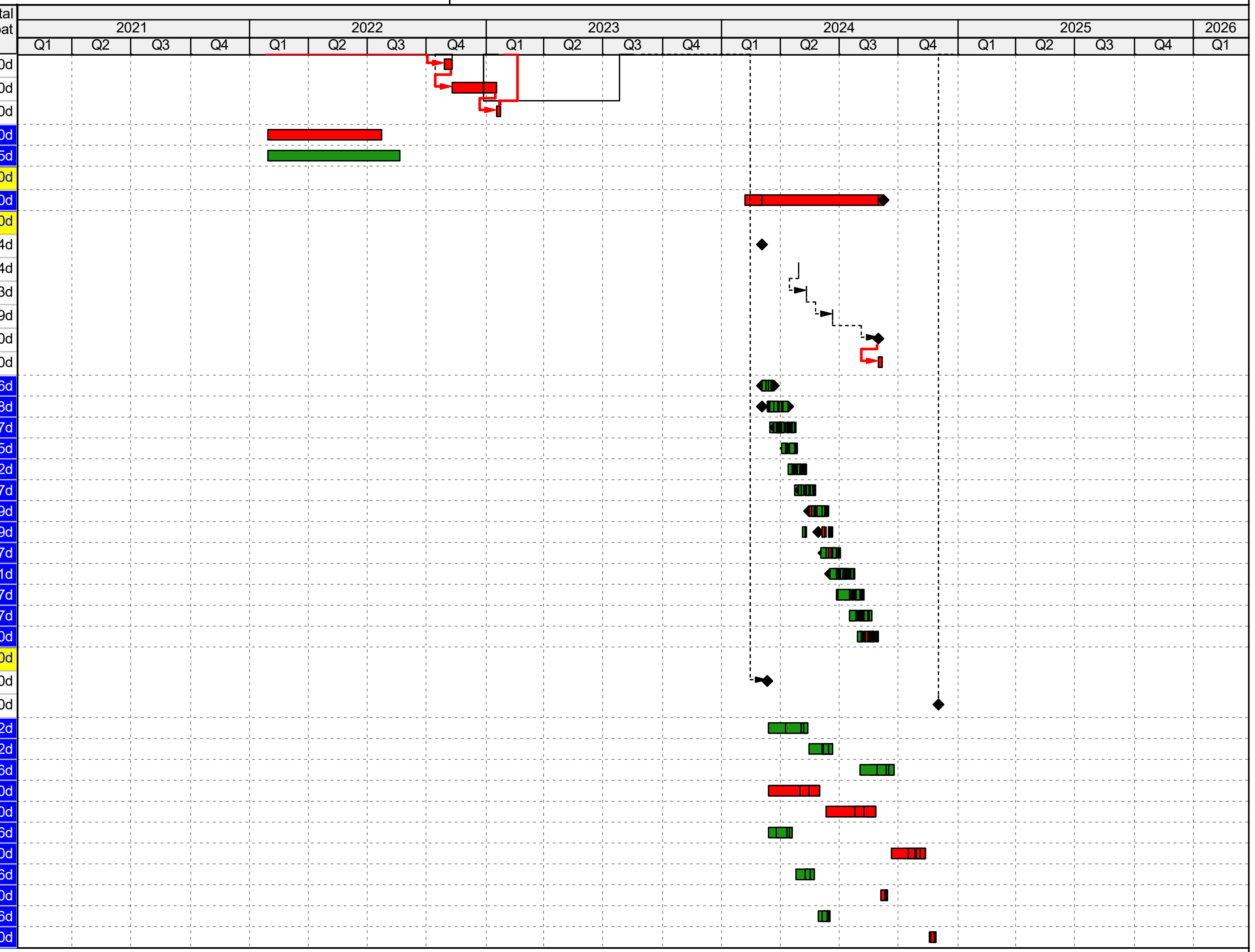


Remaining Work ◆ Milestone
Critical Primary

Coastal Transmission System
Transmission Integrity Management Capability (CTS TIMC)
Master Schedule - CPCN

29-Jan-21 08:50

Activity ID	Activity Name	Start	Finish	Original Duration	Total Float
TIMC-ENG-1020	Design Review	29-Oct-22	10-Nov-22	10d	0d
TIMC-ENG-1030	Prepare IFC Package	10-Nov-22	18-Jan-23	50d	0d
TIMC-ENG-1040	Issue IFC Package	18-Jan-23	24-Jan-23	5d	0d
M-0002.3.C.03 Pipeline		28-Jan-22	23-Jul-22	151d	0d
M-0002.3.C.04 Stations		28-Jan-22	20-Aug-22	175d	115d
M-0002.3.D Construction Management		05-Feb-24	07-Sep-24	186d	0d
M-0002.3.D.01 Construction Services		05-Feb-24	07-Sep-24	186d	0d
M-0002.3.E Pipeline/Area		04-Mar-24	06-Sep-24	162d	0d
TIMC-PIP-1930	Pipeline Construction Start	04-Mar-24		0d	24d
TIMC-PIP-3150	FEI Operations to Regasify Pipeline System	28-Apr-24	28-Apr-24	1d	104d
TIMC-PIP-1120	FEI Operations to Regasify Pipeline System	11-May-24	11-May-24	1d	93d
TIMC-PIP-1670	FEI Operations to Regasify Pipeline System	21-Jun-24	21-Jun-24	1d	59d
TIMC-PIP-2490	End Construction		29-Aug-24	0d	0d
TIMC-PIP-2500	Demobilize All Pipeline Crews	30-Aug-24	06-Sep-24	7d	0d
M-0002.3.E.01 Pipeline - TIL BEN 323 (Event 5) - Direct		04-Mar-24	22-Mar-24	16d	146d
M-0002.3.E.03 Pipeline - TIL BEN 323 (Event 3) - Direct		04-Mar-24	12-Apr-24	34d	128d
M-0002.3.E.05 Pipeline - TIL FRA 508 (Event 1) - Direct		15-Mar-24	24-Apr-24	35d	117d
M-0002.3.E.07 Pipeline - TIL FRA 508 (Event 6) - Direct		03-Apr-24	27-Apr-24	22d	75d
M-0002.3.E.09 Pipeline - LIV COQ 323 (Event 9) - Direct		12-Apr-24	10-May-24	26d	72d
M-0002.3.E.11 Pipeline - CPH NOO 508 (Event 1) - Direct		23-Apr-24	24-May-24	29d	67d
M-0002.3.E.13 Pipeline - CPH NOO 508 (Event 4 & 5) - Direct		16-May-24	14-Jun-24	26d	59d
M-0002.3.E.15 Pipeline - CPH NOO 508 (Event 9) - Direct		04-May-24	20-Jun-24	41d	59d
M-0002.3.E.17 Pipeline - CPH NOO 508 (Event 14) - Direct		03-Jun-24	03-Jul-24	27d	17d
M-0002.3.E.19 Pipeline - CPH NOO 508 (Event 20) -Direct		17-Jun-24	24-Jul-24	33d	11d
M-0002.3.E.21 Pipeline - HUN ROE 1067 (Event 12) - Direct		26-Jun-24	07-Aug-24	37d	17d
M-0002.3.E.23 Pipeline - HUN NIC 762 (Event 36) - Direct		17-Jul-24	20-Aug-24	30d	7d
M-0002.3.E.25 Pipeline - HUN NIC 762 (Event 41) - Direct		29-Jul-24	29-Aug-24	28d	0d
M-0002.3.F Facilities/Area		11-Mar-24	02-Dec-24	185d	0d
TIMC-FAC-1230	Facilities Construction Start	11-Mar-24		0d	0d
TIMC-FAC-1220	Facilities Construction Finish		02-Dec-24*	0d	0d
M-0002.3.F.01 Station 1 - Huntingdon Control Station - Direct		14-Mar-24	13-May-24	41d	112d
M-0002.3.F.03 Station 2 - Livingstone Regulating Station - Direct		16-May-24	20-Jun-24	24d	112d
M-0002.3.F.05 Station 3 - Coquitlam Regulating Station - Direct		01-Aug-24	23-Sep-24	36d	46d
M-0002.3.F.07 Station 4 - Nichol Valve Station - Direct		14-Mar-24	31-May-24	54d	0d
M-0002.3.F.09 Station 5 - Roebuck Regulating Station - Direct		10-Jun-24	26-Aug-24	54d	0d
M-0002.3.F.11 Station 6 - Fraser Gate Station - Direct		14-Mar-24	18-Apr-24	24d	46d
M-0002.3.F.13 Station 7 - Tilbury Regulating Station - Direct		19-Sep-24	11-Nov-24	36d	0d
M-0002.3.F.15 Station 8 - Port Mann Valve Station - Direct		24-Apr-24	24-May-24	21d	46d
M-0002.3.F.17 Station 9 - Benson Regulating Station - Direct		03-Sep-24	13-Sep-24	8d	0d
M-0002.3.F.19 Station 10 - Cape Horn Regulating Station - Direct		29-May-24	17-Jun-24	13d	46d
M-0002.3.F.21 Station 11 - Tilbury LNG Plant - Direct		18-Nov-24	28-Nov-24	8d	0d



Remaining Work ◆ Milestone
Critical Primary

Appendix G

FINANCIAL ANALYSIS

FILED CONFIDENTIALLY

Appendix G-1

ALTERNATIVES COST ANALYSIS

FILED CONFIDENTIALLY

Appendix G-2

FINANCIAL SCHEDULES FOR PREFERRED ALTERNATIVE

FILED CONFIDENTIALLY

Appendix H

ENVIRONMENTAL OVERVIEW ASSESSMENT REPORT

Environmental Overview Assessment

Project No.: 110904209

CTS Transmission Integrity Management Capability Project

Prepared for:

FortisBC Energy Inc.

Prepared by:

Stantec Consulting Ltd.

Document Number:

M-0002-ENV-EOA-0001

Revision: 2

2020-11-17

Sign-off Sheet

This document entitled Environmental Overview Assessment was prepared by Stantec Consulting Ltd. ("Stantec") for the account of FortisBC Energy Inc. (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Ellie Zajc Digitally signed by Ellie Zajc Date: 2020.11.17 13:13:16 -08'00'
(signature)

Ellie Zajc, B.Sc., M.E.S.

Reviewed by Digitally signed by Kara Hewgill Date: 2020.11.18 13:17:42 -08'00'
(signature)

Kara Hewgill, B.Sc.

Approved by Digitally signed by Penner, Michelle Date: 2020.11.17 12:57:55 -08'00'
(signature)

Michelle Penner, R.P.Bio.

Revision Information

Rev	Date	Issue Status	Description of Changes	Prepared	Reviewed	Approved
A	2020-10-07	Issued for Review	First draft for technical QR and IR	Ellie Zajc	Bob Fuller	Michelle Penner
					Sandra Nelson	
					Colleen Bryden	
					Kara Hewgill	
0	2020-10-16	Issued for Use	Incorporated FEI's comments	Ellie Zajc	Kara Hewgill	Michelle Penner
1	2020-11-04	Re-Issued for Use	Incorporated Scope Changes	Ellie Zajc	Kara Hewgill	Michelle Penner
2	2020-11-16	Re-Issued for Use	Incorporated FEI's comments	Ellie Zajc	Kara Hewgill	Michelle Penner

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

FortisBC Energy Inc. (FEI) is proposing the Coastal Transmission System Transmission Integrity Management Capability (CTS TIMC) Project to mitigate the potential for pipeline ruptures due to stress corrosion cracking and other crack-like imperfections. A total of 13 discrete pipeline modification areas (“events”) and 13 facility modifications are proposed for the CTS TIMC Project. This environmental overview assessment (EOA) was informed by a desktop review and field surveys. A desktop review was completed for each of the 13 events and 13 facilities to identify potential environmental or land use issues, constraints, or concerns. The purpose of this EOA is to describe environmental or land use resources or constraints that are present within or adjacent to the CTS TIMC Project areas, potential impacts on environmental or land use resources, and mitigation measures that could be used for environmental protection.

Land use surrounding the events and facilities varies from urban to agricultural. One proposed event and three facilities are in or near parks or municipally designated ecologically significant areas. Four of the proposed events and two facilities are within the agricultural land reserve.

The contaminated sites desktop review and field survey identified five areas of potential environmental concern that require additional investigation prior to environmental media removal. Fill of unknown quality may be present at each of the CTS TIMC Project events and facilities. If historical analytical data are not available to verify the quality of fill currently in place at the events and facilities, soil samples will be required to characterize fill leaving the event or facility for disposal.

The vegetation field survey identified appropriate habitat at two events for one plant species of conservation concern and plants characteristic of one blue-listed ecological community were observed at one event. Three events may interact with trees growing adjacent to the existing FEI pipeline right-of-way and the temporary workspace (TWS) at three facilities may interact with trees. Two species of weeds listed in Schedule A (Part 1) of the BC Weed Control Regulation were identified during the field survey, affecting two proposed events,
and the desktop review revealed one facility, Port Mann Valve Station, with a Schedule A noxious weed observation within 100 m (Japanese knotweed).

Most events and facilities are areas with low wildlife habitat potential. Two events, TIL BEN 323 Event 3 and TIL BEN Event 5, would occur near Burns Bog in the City of Delta, which supports numerous species of conservation concern. Three facilities have notable wildlife habitat features at or adjacent to the facility or TWS (Port Mann Valve Station, Noons Creek Valve Assembly, and Huntingdon Control Station). Wetland or watercourse habitat that may support amphibians was observed within or adjacent to four events and one facility. Mature, stand-alone trees adjacent to three events are likely to support nesting songbirds during the breeding season.

The desktop review identified five events within 30 m of a watercourse (e.g., stream, ditch, or wetland). Three events and one facility with TWS (Port Mann Value Station) are within 10 m of a watercourse. Culvert works at TIL BEN 323 Event 5 would occur within the ditches, so the works are considered to have moderate risk to fish and fish habitat values.

Regulatory requirements under the federal *Fisheries Act* are expected to *be required for one event. Provincial permits under the Agricultural Land Commission Act, Wildlife Act*, and *Water Sustainability Act* are anticipated to be required for five events and two facilities. Permits under municipal bylaws are anticipated to be required for two events and seven facilities.

Environmental and land use constraints are applicable to 9 of the 13 events and seven of the 13 facilities. Soil handing procedures are proposed as a mitigation measure to maintain soil capability for events in the Agricultural Land Reserve. This soil handling procedure is also recommended for one area that supports plants indicative of a provincially listed ecological community. Where work for the CTS TIMC Project could affect trees, hydrovacing under the supervision of a certified arborist is recommended. Noxious weed control is also recommended for all relevant events and facilities. Wildlife and wildlife habitat mitigation measures proposed include avoiding work in wildlife habitat, conducting pre-construction nest surveys if working during the bird nesting period (at relevant sites), and including wildlife salvage for work that may directly affect amphibians, small mammals of conservation concern, or reptiles. Avoiding or reducing work in watercourses is recommended to mitigate potential impacts on fish and fish habitat. Construction monitoring, erosion and sediment control, and developing a spill response plan are proposed to protect fish habitat and water quality. Soil characterization sampling is recommended for soils that will be disposed after hydrovac activities since the soil properties at many events and facilities are not known. Visual or olfactory indications of contamination should prompt a procedure for halting work and soil testing. After implementation of the proposed mitigation measures, the impact of the CTS TIMC Project on environmental and land use resources is anticipated to be low to moderate.

Abbreviations

ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
APEC	areas of potential environmental concern
AST	above-ground storage tank
BC	British Columbia
BC ENV	BC Ministry of Environment and Climate Change Strategy
BCUC	British Columbia Utilities Commission
BTEX	benzene, toluene, ethylbenzene, xylenes
COC	contaminant of concern
COSEWIC	The Committee on the Status of Endangered Wildlife in Canada
COSMOS	City of Surrey Mapping Online System
CPCN	Certificate of Public Convenience and Necessity
CSR	Contaminated Sites Regulation (BC)
CTS TIMC	Coastal Transmission System Transmission Integrity Management Capability
DBH	Diameter at breast height. Diameter of a tree measured at 1.4 m above ground surface.
EOA	environmental overview assessment
EMAT	electromagnetic acoustic transducer
ERIS	Environmental Risk Information Services
ESC	erosion and sediment control
FEI	FortisBC Energy Inc.
HEPH	heavy extractable petroleum hydrocarbons
HDD	horizontal direction drill
ILI	in-line inspection
LEPH	light extractable petroleum hydrocarbons
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
PAH	polycyclic aromatic hydrocarbons
PFAS	per- and polyfluoroalkyl substances
ROW	right-of-way
SARA	Federal *Species at Risk Act*
TWS	temporary workspace
VOC	volatile organic compounds
VPH	volatile petroleum hydrocarbons
WSA	*Water Sustainability Act*

1.0 Introduction

FortisBC Energy Inc. (FEI) is proposing the Coastal Transmission System Transmission Integrity Management Capability (CTS TIMC) Project in the Lower Mainland and Fraser Valley regions of British Columbia (BC) to mitigate the potential for pipeline ruptures due to stress corrosion cracking and other crack-like imperfections. FEI proposes to use electromagnetic acoustic transducer (EMAT) in-line inspection (ILI) (running a smart pig through the pipeline) to mitigate the potential for stress corrosion cracking and other crack-like imperfections. A program of velocity excursion reviews of FEI's Coastal Transmission System, in the Lower Mainland and Fraser Valley revealed pipeline modifications that are required to facilitate EMAT ILI tool movement:

- pipeline replacement to reduce heavy walls
- replacement of tight radius bends
- removal of unbarred-tees, plug valves, or reduced port-valves
- recoating of discrete pipeline sections

Stantec Consulting Ltd. (Stantec) was retained by FEI to prepare this environmental overview assessment (EOA) to support CTS TIMC Project planning and environmental approvals. The CTS TIMC Project 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* prior to commencing construction. This EOA will be used by FEI in support of the CPCN application.

The purpose of this EOA is to describe:

- environmental or land use resources or constraints that are present within or adjacent to the Project areas
- potential impacts on environmental or land use resources
- mitigation measures that could be used for environmental protection

1.1 Project Description

The CTS TIMC Project has been separated into two parts, for engineering and logistical purposes: pipeline mitigations and facilities (Figure 1). FEI is proposing pipeline mitigation works on six pipeline segments within the Coastal Transmission System:

- TIL BEN 323
- TIL FRA 508
- LIV COQ 323
- HUN NIC 762

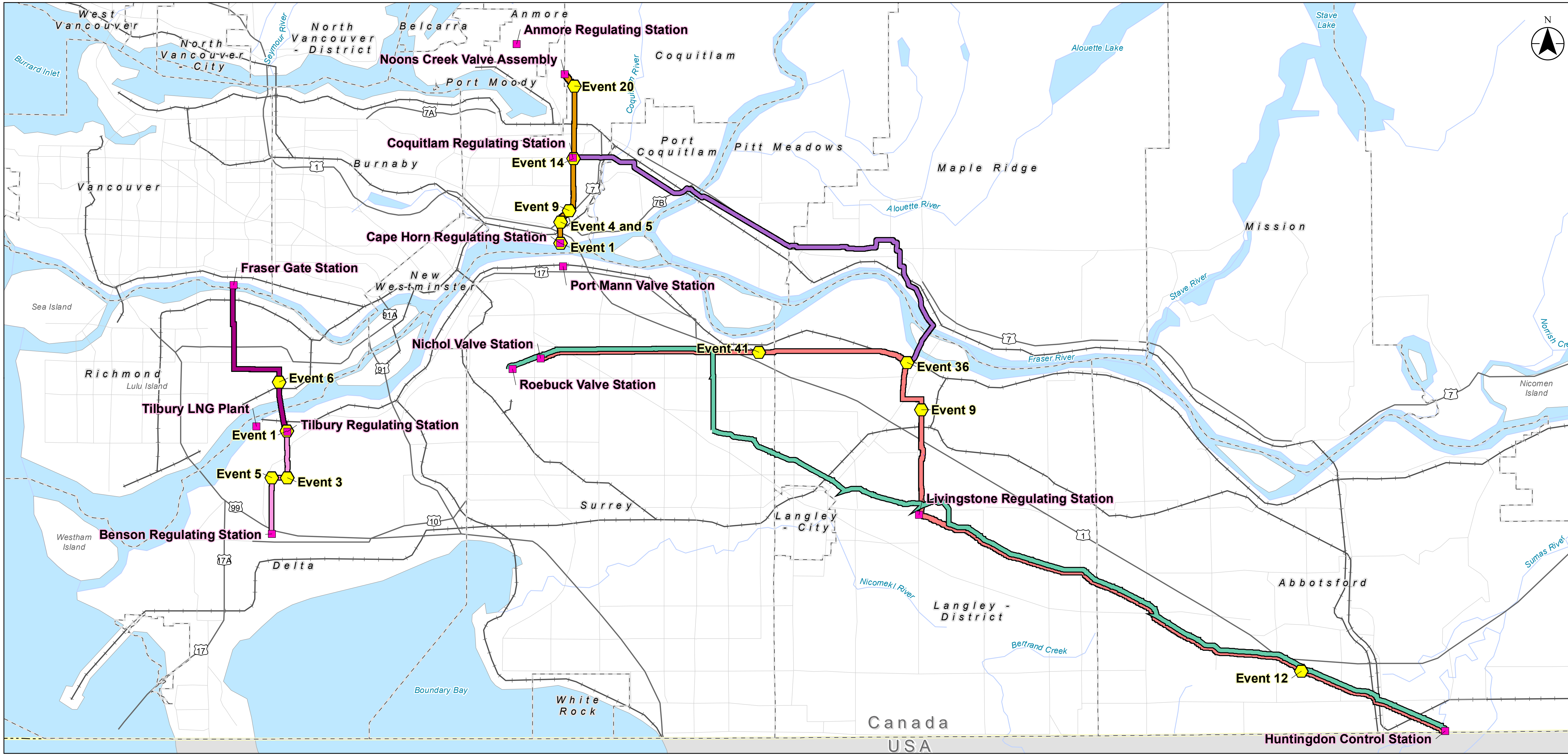
- CPH NOO 508
- HUN ROE 1067

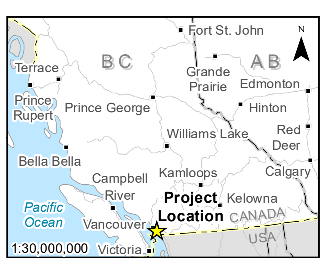
A total of 13 discrete pipeline modification areas ("events") are proposed for pipeline mitigation works for the CTS TIMC Project (Table 1). All events are in FEI's existing statutory right-of-way (ROW). Many proposed events also include some work within FEI facilities. Pipeline mitigations outside of facilities are proposed to occur as open cut or trenchless techniques. Trenchless techniques will occur where works are required under roads and other existing infrastructure.

Table 1: Description of CTS TIMC Project Events

Pipeline Segment	Event Number	Length (m)	Activity Description
TIL BEN 323	3	5	Replace existing bend using open cut pipeline installation.
TIL BEN 323	5	5	Replace existing bend using open cut pipeline installation.
TIL FRA 508	1	94	Pipe replacement at Tilbury Station. Replacement under River Road will use a trenchless method and the remainder will use an open cut technique.
TIL FRA 508	6	N/A	Replacement of valve assembly at Nelson Valve Site.
LIV COQ 323	9	64.6	Pipeline replacement using an open cut technique
HUN NIC 762	36	N/A	Replacement of valve assembly at Fort Langley Station and 90° 3D pipe bend. The new valve assembly will be installed above ground level.
HUN NIC 762	41	N/A	Replacement of valve assembly at Latimer Station using open cut installation, and the new valve assembly will be installed above ground level.
CPH NOO 508	1	N/A	Replacement of existing heavy wall assembly at Cape Horn Valve Site.
CPH NOO 508	4 and 5[1]	303	Pipe replacement using trenchless technique for approximately 263 m with 40 m of open cut to connect to the existing pipeline.
CPH NOO 508	9	5	Replacement of pipe bend using open cut installation.
CPH NOO 508	14	N/A	Replacement of existing valve assembly at Coquitlam Station.
CPH NOO 508	20	125	Replacement of existing valve assembly at Westwood Station using open cut. The new valve assembly will be installed above ground level. Pipe replacement under David Avenue will use a trenchless technique.
HUN ROE 1067	12	N/A	Replacement of existing assembly at King Road Valve Site using an open cut technique. The new valve assembly will be installed above ground level.

NOTE:
[1] Considered one event





- - International Boundary
Highway
Road
Railway
Watercourse
Waterbody
Municipal Boundary

Facility
TIMC Event

TIMC Pipeline

CPH NOO & NC 508
HUN NIC 762
LIV COQ 323, BH MFL
TIL BEN 323
TIL FRA 508
HUN ROE 1067

0 2 4 6 8 10 km

1:200,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec | FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
1

Title
Overview Map

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_001_overview_map.mxd Revised: 2020-11-02 By: cmellship

Work is proposed to occur at 13 FEI existing facilities (Table 2). Four facilities would require temporary workspaces (TWS) outside the fence line for equipment and materials storage and access to the facility.

Table 2: CTS TIMC Project Facilities

Facility	Municipality	Related Event	Activity Description
Benson Regulating Station	City of Delta	N/A	Work at this station would require pig barrel modifications. All work will occur within the facility and excavations would require hydrovacing.
Tilbury LNG Plant	City of Delta	N/A	Work at this facility would require some pig barrel modifications and relocation of an above-ground assembly. All excavations at the facility would use hydrovacing.
Tilbury Regulating Station	City of Delta	TIL FRA 508 Event 1	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. All work will occur within the existing facility.
Fraser Gate Station	City of Vancouver	N/A	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. All work will occur within the existing facility.
Nichol Valve Station	City of Surrey	N/A	Facility work requires piping modifications, pig barrel modifications, and installation of pressure regulating skids. Excavation required below ground using hydrovacing. TWS is required south of the facility.
Port Mann Valve Station	City of Surrey	N/A	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. TWS would be required on the south side of the facility.
Roebuck Valve Station	City of Surrey	N/A	Work will require a new pressure regulating skid, piping modifications, and pig barrel modifications. Excavation required below ground using hydrovacing. All work will occur within the existing facility.
Cape Horn Regulating Station	City of Coquitlam	CPH NOO 508 Event 1	Work at this station would require pig barrel modifications. All work will occur within the facility and excavations would require hydrovacing.
Coquitlam Regulating Station	City of Coquitlam	CPH NOO 508 Event 14	Pressure regulating skids will be installed and modifications are proposed for piping and the pig barrel. Excavation required below ground using hydrovacing. TWS is required on an existing access road.
Noons Creek Valve Assembly	City of Coquitlam & City of Port Moody	N/A	A pressure regulating skid will be installed at the facility. TWS is proposed for facility access roads immediately west and north of the facility.

Table 2: CTS TIMC Project Facilities

Facility	Municipality	Related Event	Activity Description
Anmore Regulating Station	Village of Anmore	N/A	Existing regulation runs will be upgraded to enable continued gas supply when work occurs at Noons Creek Valve Assembly. Work will occur within the existing facility. No below ground work is required.
Livingston Regulating Station	Township of Langley	N/A	Work will require modification to station piping and pig barrel modification. Excavation required below ground using hydrovacing. All work will occur within the existing facility.
Huntingdon Control Station	City of Abbotsford	N/A	Valve, pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. An existing building will require work on internal equipment and replacement of a wall with a roller door. All work will occur within the existing facility.

Detailed maps of proposed events and facilities are provided in Appendix A.

The general sequence of works at each event will be to mobilize equipment and materials, clear vegetation, strip topsoil and grade the work area, dig ditches, modify pipes or pipe items, backfill, and site restoration (Table 3). Some works will not be applicable to some events (e.g., open cut is not applicable to an event in which only the trenchless technique is proposed).

Table 3: General Sequence of Works at Each Event or Facility

Activity	Description of Equipment and Planned Activity
Equipment and Materials Mobilization	Required equipment and materials will be transported directly to site. Contractor equipment shall arrive at site steam cleaned and in sound mechanical condition free of leaks or defects.
Clearing	Topsoil, trees, brush, and other vegetation will be cleared from the ROW, including TWS, if applicable. TWS are anticipated to be within the statutory ROW or on FEI-owned land where possible. The contractor will install temporary crossings, power line markers and road signage, and will build ramps and approaches to roads over operating pipelines (hot lines) as required. Most vegetation encountered in the events will be chipped.
Topsoil Stripping and Grading	Graders, bulldozers, and backhoes will be used to strip and stockpile topsoil (surface organic material and upper mineral soil in vegetated areas). Organic layer(s) will be stripped to specified depths and widths in agricultural lands and to a standard depth in urban lands. It is assumed that full ROW stripping will be required for agricultural lands and that stripping in urban areas will be either full ROW or ditch and spoil side only. Subsoil will only be excavated at locations where required to access the pipeline. The organic material will be stripped and stored separately from any grading subsoil or trench spoil and will be in accordance with the Environmental Protection Plan (EPP) to be developed for the CTS TIMC Project. Facilities have been assumed to lack topsoil and to have a gravel layer above a fill soil layer.
Ground Disturbance	Digging for open cut or trenchless techniques will be restricted to the pipeline ROW. Ditch work are expected to be completed via excavators and backhoes. The ditch width at the bottom will depend on pipe size and will be identified during Detailed Design. A bell hole at the trenchless crossing start and end points will be required for mitigation areas using the trenchless technique. Some areas may require hydrovacing or airvacing to expose the pipeline where there are likely to be large tree roots within the dig area. All below-ground work in facilities will use hydrovacing.
Pipe modifications	Various types of modifications will be completed, including pipeline replacement, bend replacement, valve assembly replacements, and pipeline re-coating. Installation of replacement pipe will use open cut, bore, or horizontal direction drill (HDD) installation methods. Open cut trenches will be dewatered prior to lowering and installing the new pipe segment. Some events will require hydrostatic testing, including line filling, pumping, and squeezing and drying.
Backfilling	The ditches will be backfilled using the excavated native ditch spoil. If necessary, engineered backfill, such as sand, will be imported where native ditch spoil is deemed to be potentially detrimental to the pipe and/or coating. Local imported engineered backfill sources will be selected by the contractor and approved by FEI. A combination of backhoes and bulldozers will be used for backfilling. Rock shield or similar products will be used where required.
Site restoration and reclamation	All clean-up work shall be completed as soon as practicable after completion of the pipeline construction activities. Following backfill, the pipeline contractor will be responsible for returning the grade to its original contour and re-establishing natural drainage across the ROW. The ROW and TWS will be seeded or will allow for natural revegetation after construction, depending on the requests of the landowners or site-specific conditions. Garbage will be collected on an ongoing basis and disposed of at an approved location, in compliance with local regulations. Final cleanup to return the land to an acceptable condition and address any landowner concerns or damages will occur during the following season. Areas that were originally grassed will be reseeded and will be restored to a condition as good as, or better than, their original state.

2.0 Methods

This EOA was informed by a desktop review and field surveys. A desktop review was completed for each of the 13 events and 13 facilities to identify potential environmental or land use issues, constraints, or concerns. Field surveys were then completed at the events for which potential environmental or land use issues, constraints, or concerns were identified based on the findings of the desktop review. The methods for the desktop review and field surveys are described in the following sections.

2.1 Desktop Review

The desktop review included queries of publicly available information and spatial data sources and a review of available ortho-imagery; the focus of the desktop review was relevant land use, soils, contamination, and biophysical data within 1 km of each event and facility. Table 4 is a summary of information sources accessed for the desktop review.

Table 4: Desktop Review Information Sources

Data Category	Data Source	Date of Data Access
Soil Survey	British Columbia Soil Information Finder Tool (Ministry of Agriculture and Ministry of Environment & Climate Change 2018)	September 2020
Species and ecological communities at risk	BC Conservation Data Centre (BC CDC) Species and Ecosystem Explorer (BC CDC 2020) (masked and unmasked occurrences)	September 2020
Bird species of conservation concern	eBird (BSC 2020)	September 2020
Nest locations for bald eagle, osprey, other raptors, and herons	Wildlife Tree Stewardship Atlas (Wildlife Tree Stewardship Program (2020)	September 2020
Agricultural Land Reserve boundary	BC Data Catalogue (Province of British Columbia 2020a)	September 2020
Biogeoclimatic Ecosystem classification map	MFLNRORD (2016)	September 2020
Critical habitat for federally listed species (posted)	BC Data Catalogue	August 2020
Freshwater Atlas watercourse and wetland locations	BC Data Catalogue	September 2020
Waterbody Reports	Fisheries Inventories Data Queries (Province of British Columbia 2020b)	September 2020
Watercourse locations, fish observations	iMap (Data BC 2020)	September 2020
Watercourse locations—City of Abbotsford	Abbotsford WebMap (City of Abbotsford 2020)	September 2020
Watercourse locations and classification—City of Coquitlam	QtheMap (City of Coquitlam 2020)	September 2020

Table 4: Desktop Review Information Sources

Data Category	Data Source	Date of Data Access
Watercourse locations and classification—City of Delta	DeltaMap (City of Delta 2020)	September 2020
Watercourse locations and classification—Township of Langley	GeoSource Interactive Web Map (Township of Langley 2020)	September 2020
Watercourse locations and classification—City of Port Moody	ViewPort (City of Port Moody 2020)	September 2020
Watercourse locations and classification—City of Richmond	Richmond Interactive Map (City of Richmond 2020)	September 2020
Watercourse locations and classification—City of Surrey	City of Surrey Mapping Online System (COSMOS) (City of Surrey 2020)	September 2020
Watercourse locations and classification—City of Vancouver	VanMap (City of Vancouver 2020b)	September 2020
Noxious weed occurrences	Invasive Alien Plant Sites (MFLNRORD 2020)	September 2020
Parks and protected areas	BC Data Catalogue	September 2020
City of Abbotsford Official Community Plan	Abbotsford WebMap	September 2020
City of Richmond Official Community Plan	Official Community Plan maps (City of Richmond 2019)	September 2020
City of Surrey Official Community Plan	City of Surrey Mapping Online System (COSMOS)	September 2020
City of Delta Official Community Plan	DeltaMap	September 2020
Township of Langley Official Community Plan Fort Langley Centre Community Plan Willowbrook Community Plan	GeoSource Interactive Web Map	September 2020
City of Port Moody Official Community Plan	ViewPort	October 2020
City of Vancouver Official Community Plan	Open Data Portal (City of Vancouver 2020a)	October 2020
Village of Anmore Official Community Plan	Official Community Plan and maps (Village of Anmore 2014)	October 2020
Contaminated Sites related databases and site registries	ERIS Environmental Risk Information Services Ecolog Database Report	June 2020

2.2 Field Surveys

Field surveys were completed for the biophysical environment and contaminated sites. The methods for these surveys are described in the following sections.

2.2.1 Biophysical Environment

Field surveys were completed by Stantec biologists on August 21 and September 2, 2020. Observations extended to approximately 10 m on either side of the existing pipeline ROW. This survey area reflects the extent within which there is potential for Project-related activities to affect vegetation, wildlife and wildlife habitat, and fish and fish habitat.

Biophysical field surveys were completed for 10 events and one facility. Field surveys were not undertaken at the three events for which the desktop review indicated a low potential for biophysical values; specifically, these were events planned to occur entirely within a facility with no nearby vegetation or watercourses (i.e., TIL FRA 508 Event 6, CPH NOO Event 1, and HUN ROE 1067 Event 12). Additionally, access to the southern portion of CPH NOO 508 Event 4 & 5 was not possible due to safety concerns (i.e., active railway corridor). A field survey was completed for only one facility because desktop reviews indicated a low potential for biophysical values at the remaining 12 facilities.

The vegetation survey identified the occurrence of trees, ecological communities of interest (e.g., wetlands, mature forest, wildlife tree patches, and provincially red- or blue-listed communities), and plant species of interest (i.e., red- or blue-listed plants and invasive plants). The survey also identified areas potentially requiring additional assessment (e.g., arborist survey) or that posed potential management concerns related to construction (e.g., noxious weeds requiring additional management to limit spread). The species and diameter of trees within and adjacent to events were recorded.

The wildlife and wildlife habitat survey assessed the potential for the occurrence of species of conservation concern and their potential habitat, invasive wildlife, and protected wildlife features (e.g., protected raptor nests). The survey also identified areas potentially requiring additional assessment (e.g., pre-construction nesting bird survey) and mitigation measures (e.g., wildlife salvage).

The fish and fish habitat field survey was undertaken to confirm watercourse locations and connectivity identified during the desktop review. All events with watercourses (e.g., streams, ditches, or wetlands) within 30 m of proposed works were reviewed, except those where works were restricted to within facilities. The field survey reviewed instream and riparian fish habitat characteristics and identified fish habitat quality in watercourses that could be affected by the CTS TIMC Project. It assessed the potential need for detailed stream assessments, watercourse-related permitting, and fish salvage based on the type and methodology of work to be undertaken. Fish presence surveys and detailed stream assessments were not undertaken.

The municipalities in the CTS TIMC Project area have different watercourse classifications. Since the BC Oil and Gas Commission will likely be the regulator for FEI's *Water Sustainability Act* permit approvals, watercourse classifications in Section 22 of the *Environmental Protection and Management Regulation* were adopted (Table 5).

Table 5: Watercourse Classification Used in the Environmental Overview Assessment

Class	Description
S1A	A fish stream or stream in a community watershed that averages over 1-km in length and a stream width or an active flood plain width of 100 m or greater.
S1B	A fish stream or stream in a community watershed with a width greater than 20 m.
S2	A fish stream or stream in a community watershed with a width greater than 5 m and less than 20 m.
S3	A fish stream or stream in a community watershed that is not less than 1.5 m but less than 5 m.
S4	A fish stream or stream in a community watershed with a width less than 1.5 m.
S5	A stream that is not a fish stream and is located outside a community watershed with a width greater than 3 m.
S6	A stream that is not a fish stream and is located outside a community watershed with a width equal to or less than 3 m.
NCD	Non-classified drainage (poorly defined channel and banks, no evidence of scour, not continuous for greater than 100 m, no connection to downstream fish habitats; not fish-bearing).

2.2.2 Contaminated Sites

The contaminated sites field surveys were completed by a Stantec environmental specialist during September and October 2020 and covered 12 locations (events and facilities). The visual surveys were restricted to areas where Project-related activities could cause disturbance of environmental media (i.e., soils, sediment, water, and vapour) in an area that could be affected by nearby or onsite environmental contamination.

The contaminated sites field surveys visually assessed for the potential of environmental contamination associated with the following:

- current site operations
- waste generation
- fuel, chemical and waste storage
- exterior site condition observations including surface features, fill material and wells
- potential offsite sources of contamination

Locations with available 3D imagery was virtually visually assessed through Cintoo Cloud, and in some cases a physical field survey was, therefore, not considered necessary.

3.0 Environmental Overview

3.1 Study Area

The 13 events are proposed to occur within six municipalities, five within the Metro Vancouver Regional District and one within the Fraser Valley Regional District (City of Abbotsford). Work within the 13 facilities for the CTS TIMC Project would occur within eight municipalities, also within the Metro Vancouver Regional District and the Fraser Valley Regional District.

Most of the proposed events are within the Coastal Western Hemlock Very Dry Maritime variant (CWHxm1) biogeoclimatic zone; although some events are proposed for locations within the Coastal Douglas-fir Moist Maritime (CDFmm) and Coastal Western Hemlock Dry Maritime (CWHdm) biogeoclimatic zones (MFLNRORD 2016).

3.2 Land Use

The surrounding land use for the proposed events is a mixture of agricultural, residential, and industrial, as designated in municipal official community plans.

3.2.1 Pipeline Mitigation Events

Eight of the 13 proposed events are in developed urban areas designated as residential or industrial land uses (Table 6). One proposed event is within a municipally designated ecologically significant area: TIL BEN 323 Event 3 is adjacent to Burns Bog, an Ecological Conservancy Area in the City of Delta.

Four of the proposed events are within the Agricultural Land Reserve (ALR):

- TIL BEN 323 Event 3
- TIL BEN 323 Event 5
- LIV COQ 323 Event 9
- HUN ROE 1067 Event 12

One of these events is proposed to occur entirely within a facility (HUN ROE Event 12).

Table 6: Land Use Designations for Proposed CTS TIMC Project Events

Pipeline	Event	Municipality	Land Use				
			Industrial	Residential/ Urban	Commercial/ Institutional	Agricultural/ Rural	Greenway or Urban Park/ Wildlands
TIL BEN 323	3	City of Delta				X	
TIL BEN 323	5	City of Delta				X	
TIL FRA 508	1	City of Delta	X				
TIL FRA 508	6	City of Richmond	X				
LIV COQ 323	9	Township of Langley				X	
HUN NIC 762	36	Township of Langley		X			
HUN NIC 762	41	City of Surrey	X	X			
CPH NOO 508	1	City of Coquitlam	X				
CPH NOO 508	4 & 5	City of Coquitlam	X	X			
CPH NOO 508	9	City of Coquitlam		X			
CPH NOO 508	14	City of Coquitlam			X		
CPH NOO 508	20	City of Coquitlam					X
HUN ROE 1067	12	City of Abbotsford				X	

3.2.2 Facilities

The facilities are industrial sites, but they have various surrounding land use types (Table 7). Eight of the 13 facilities are within urban areas (including industrial, residential, and civic or institutional). Two facilities are within municipally designated agricultural land use and these facilities are also within the ALR (Huntingdon Control Station and Benson Regulating Station). Three facilities are adjacent to municipal parkland or greenbelt, and TWS at all three facilities is proposed to occur within or near the parkland or greenbelt:

- Nichol Valve Station TWS would intersect with the multi-use path in a greenbelt area.
- Port Mann Valve Station is within land designated as municipal park and TWS is proposed on the north and south sides of the facility.
- Noons Creek Valve Station is within parkland (Noons Creek Park in the City of Coquitlam and Panorama Drive Greenway in the City of Port Moody), although TWS is proposed for maintained access roads extending west and north from the facility.

Table 7: Land Use Designations for Proposed CTS TIMC Project Facilities Work

Facility (Associated Event, if applicable)	Municipality	Land Use				
		Industrial	Residential/ Urban	Commercial/ Institutional	Agricultural/ Rural	Greenway or Park/ Wildlands
Benson Regulating Station	City of Delta				X	
Tilbury LNG Plant	City of Delta			X		
Tilbury Regulating Station (TIL FRA 508 Event 1)	City of Delta			X		
Fraser Gate Station	City of Vancouver		X			
Nichol Valve Station	City of Surrey		X			X
Roebuck Valve Station	City of Surrey		X			
Port Mann Valve Station	City of Surrey					X
Livingston Regulating Station	Township of Langley		X			
Cape Horn Regulating Station (CPH NOO 508 Event 1)	City of Coquitlam	X				
Coquitlam Regulating Station (CPH NOO 508 Event 14)	City of Coquitlam			X		
Noons Creek Valve Assembly	City of Coquitlam & City of Port Moody					X
Huntingdon Control Station	City of Abbotsford				X	
Anmore Regulating Station	Village of Anmore			X		

3.3 Soils

The proposed events are within a range of soil types (Table 8). Soil types were not reviewed for the facilities since the soil was assumed to be non-native fill materials imported to the facility when it was constructed.

Table 8: Soil Information for CTS TIMC Project Events

Pipeline Segment	Event	Soil Name	Soil Texture	Drainage
TIL BEN 323	3	LUMBUM	N/A	Very poorly drained
TIL BEN 323	5	LUMBUM	N/A	Very poorly drained
TIL FRA 508	1	CRESCENT	Silt loam	Poorly drained
		WESTHAM	Silt loam	Poorly drained
TIL FRA 508	6	DELTA	Silty clay loam	Poorly drained
LIV COQ 323	9	MILNER	Silty clay loam	Moderately well drained
HUN NIC 762	36	MARBLE HILL	Silt loam	Well drained
HUN NIC 762	41	SUNSHINE	Sandy loam	Well drained
CPH NOO 508	1	Unclassified urban	N/A	N/A
CPH NOO 508	4 & 5	Unclassified urban	N/A	N/A
CPH NOO 508	9	Unclassified urban	N/A	N/A
CPH NOO 508	14	Unclassified urban	N/A	N/A
CPH NOO 508	20	BUNTZEN	Sandy loam	Moderately well drained
HUN ROE 1067	12	RYDER	Silt loam	Well drained

3.4 Contaminated Sites

To complete the desktop review, Stantec reviewed an environmental database report (dated June 12, 2020) provided by Environmental Risk Information Services (ERIS) that summarized the findings of an environmental database search of sites within a 250 m radius of the FEI pipelines requiring mitigation works. Within the database report, two properties were identified as areas of potential environmental concern (APECs) where contaminated media (i.e., soils, sediment, water, or vapour) may be present and could potentially affect the proposed work areas. These properties are located within 100 m of one or more proposed events/facility works. Stantec also reviewed current aerial photographs of each event and identified five additional APECs where contaminated media may be present.

Current or historical migration of contamination from these APECs to the proposed FEI event/facility locations may have occurred and be present in environmental media to be managed at the event location. The seven APECs were identified based on their proximity to mitigation works, presence of historical or current contamination on the property, as well as historical and current property use.

To determine the applicable soil and groundwater quality standards for the proposed events, the following site conditions were considered:

- The land use for each proposed event or disposal facility.
- Drinking water use standards are applicable at all sites in BC, unless precluding conditions are met, per BC Ministry of Environment and Climate Change Strategy (BC ENV) Protocol 21 for Contaminated Sites: Water Use Determination, or unless a BC ENV Director approves otherwise.
- Contaminated Sites Regulation (CSR) soil matrix numerical standards for human health protection for the intake of contaminated soil are applicable at all sites in BC.
- CSR soil matrix numerical standards for environmental protection for toxicity to invertebrates and plants are applicable to all sites in BC.
- Distance to aquatic environment.
- If any irrigation or livestock watering from groundwater is used within 500 m of the site.
- For disposal purposes, all site conditions for all land and water uses are considered applicable, (as soil disposal locations are not yet know for certain). Based on the current unknown classification of disposal facilities, the applicable standards are as follows:
    - BC CSR Schedule 3.1, Part 1—Matrix Numerical Soil Standards (All land uses and site-specific factors)
    - BC CSR Schedule 3.1, Part 2—Generic Numerical Soil Standards to Protect Human Health (All land uses)
    - BC CSR Schedule 3.1, Part 3—Generic Numerical Soil Standards to Protect Ecological Health (All land uses)
    - BC CSR Schedule 3.2—Generic Numerical Groundwater Standards (All water uses)

Therefore, the most stringent standard for all land and water uses may be applied, unless a specific land or water use has been determined not applicable.

Based on the findings of the desktop review, five APECs were identified within 100 m of one or more proposed events (Table 9). Twelve additional areas, referred to as "Activity Areas" were identified as requiring additional field surveys. In addition to these five APECs identified, Stantec understands that fill of unknown quality will also be present at each of the TIMC Project events. Unless historical analytical data are available to verify the quality of the fill currently in place at the proposed events, soil samples will be required to characterize fill leaving the events for disposal. The five APECs are summarized in Table 9 based on the findings of the desktop review.

Table 9: APECs Identified within 100 m of Proposed CTS TIMC Project Events

Pipeline	APEC Address	Event	Distance from Event (m)	Description of Potentially Contaminated Site
HUN NIC 762	9470 192 Street, Surrey	41	Onsite	• Large commercial vehicle storage
TIL FRA 508	7389 River Road, Delta	1	Onsite	• Husky fuel service station • 2014: waste generator (fuel)
TIL FRA 508	34—7621 Vantage Way, Delta	1	35 m southeast	• Dry-cleaning facility
CPH NOO 508	775 Mariner Way, Coquitlam	14	15 m southwest	• Fire station
TIL LNG	7651 Hopcott Road, Delta	Tilbury LNG Plant	Onsite	• Natural gas processing • 2014: further investigation required by Ministry

3.4.1 Field Survey Findings

The contaminated sites field surveys focused on the 12 proposed events and facilities requiring additional information following desktop review. Field surveys identified visual indications of site activities surrounding land uses that may result in the presence of contamination at an event (Table 10).

Table 10: Contamination Field Survey Observations

Relevant Pipeline Event or Facility	Location of work Related to Event/Facility	Field Survey Observations
TIL FRA 508 Event 1	• FEI station • a portion of River Road • Husky fuel service station	• A heater building was present at the site during the field observation, containing a 55-gallon (208 L) drum and several 23 kg pails of glycol. No staining was observed within the building or at the valve site. • A drycleaner was located adjacent 95 m southeast of the proposed event (34—7621 Vantage Way, Delta). • A vehicle repair shop was present 25 m east of the event (7399 Vantage Way, Delta). • Visual signs of environmental contamination were not observed in the surrounding area.
CPH NOO 508 Event 1	• FEI station	• No staining or chemical/fuel storage was observed at the valve station during the field survey. • Seacan storage was present surrounding the site, with no indication of contamination. • Visual signs of environmental contamination were not observed within the surrounding area
CHP NOO 508 Event 4 & 5	• FEI station	• No staining or chemical/fuel storage was observed at the valve station during the field survey. • Seacan storage was present surrounding the site, with no indication of contamination. • Visual signs of environmental contamination were not observed within the surrounding area
CPH NOO 508 Event 14	• gravel parking lot • underneath a rail line • underneath a portion of Lougheed Highway • green space adjacent to the Highway	• No staining was observed at the gravel parking lot during the field survey. • Visual signs of environmental contamination were not observed within the surrounding area
CPH NOO 508 Event 20	• FEI station • underneath a portion of David Avenue • green space adjacent to roadway	• No staining or chemical/fuel storage was observed at the station during the field survey. • Visual signs of environmental contamination were not observed within the surrounding area • Indications of residential heating oil tanks were not observed on adjacent properties
Fraser Gate Station	• FEI station	• No staining or chemical/fuel storage was observed at the station during the field survey • Visual signs of environmental contamination were not observed within the surrounding area • Indications of residential heating oil tanks were not observed on adjacent properties
HUN NIC 762 Event 41	• FEI station • commercial property adjacent to the east	• No staining or chemical/fuel storage was observed at the station during the field survey • Commercial trucks were observed parked on adjacent gravel lot within footprint of event; minor staining was observed • Mechanical shops were observed approximately 35 m northeast and 65 m south of Event Site. Operations were observed to be conducted indoors over concrete floors.

Table 10: Contamination Field Survey Observations

Relevant Pipeline Event or Facility	Location of work Related to Event/Facility	Field Survey Observations
Huntingdon Regulating Station[1]	• FEI regulating station	• Based on a review of 3D scans of the facility, the following was observed: o Staining or chemical/fuel storage was not observed onsite. o Operations of potential environmental concern were not identified on surrounding properties.
Livingstone Regulating Station	• FEI Regulating Station	• No staining or chemical/fuel storage was observed onsite during the field survey. • Visual signs of environmental concern were not observed within the surrounding area. • Indications of residential heating oil tanks were not observed on adjacent properties.
Roebuck Valve Station	• FEI station	• No staining or chemical/fuel storage was observed onsite. • Visual signs of environmental contamination were not observed within the surrounding area.
TIL FRA Event 6	• FEI station	• No staining or chemical/fuel storage was observed onsite during the field survey. • The adjacent warehousing properties were observed to be paved and materials were not observed to be stored on outdoor areas. • Visual signs of environmental contamination were not observed within the surrounding area.
Tilbury LNG Plant	• FEI station	• Staining was not observed onsite. • Various above-ground storage tanks (ASTs) were observed onsite (one AST was labelled indicating it contained liquid nitrogen; labels were not observed on the remaining ASTs). • Two pad-mounted electrical transformers were observed on the site. Stickers indicating polychlorinated biphenyl-content of the transformer oil were not observed.

[1] Based on available information (3D scans, and map information for the surrounding area) a physical field survey was not conducted for this location.

3.4.2 Areas of Potential Environmental Concern

Five APECs were identified during the desktop review and one additional APEC was identified based on field survey findings as potentially requiring additional investigation prior to environmental media removal from the event or facility (Table 11). Stantec understands that pipeline mitigation activities will include varying depths of soil excavations and that groundwater may be encountered within some events. If dewatering must be completed at an event, groundwater disposal will be required. For this reason, APECs and contaminants of concern (COC) for both soil and groundwater have been considered applicable for the purposes of this review. As previously mentioned, fill soils, along the pipeline right-of-way, have not been analyzed for disposal purposes, as such, Stantec recommends that these soils be assessed for parameters that may be required by the disposal receiving facility.

Table 11: Contaminants of Concern at Proposed CTS TIMC Project Events

Pipeline	Event	APEC	Distance from Event (m)	Contaminants of Concern
				•
HUN NIC	41	Len's Ranger Transport: large commercial vehicle storage adjacent to and on proposed event. Automotive repair shops	Onsite 35 m northeast	• Light and Heavy Extractable Petroleum hydrocarbons (LEPH/HEPH) • PAH • benzene, toluene, ethylbenzene, xylenes (BTEX)/volatile petroleum hydrocarbons (VPH) • metals
TIL FRA	1	Tilbury Husky fuel service station (gas station)	Onsite	• LEPH/HEPH • PAH • BTEX/VPH • Metals • volatile organic compounds (VOCs)
TIL FRA	1	Dry cleaning facility	95 m southeast	• volatile organic compounds (VOCs)
CPH NOO 508	4 & 5	Rail line	Onsite	• LEPH/HEPH • PAH • metals
CPH NOO 508	14	Diesel generator and AST Fire station	Onsite 15 m southwest	• LEPH/HEPH • PAH • BTEX/VPH • Per- and polyfluoroalkyl substances (PFAS) • metals

Table 11: Contaminants of Concern at Proposed CTS TIMC Project Events

Pipeline	Event	APEC	Distance from Event (m)	Contaminants of Concern
Tilbury LNG Plant	N/A	Various ASTs Pad-mounted Electrical Transformers Historical request from the Ministry for additional environmental investigation related to LNG Plant	Onsite	• LEPH/HEPH • PAH • BTEX/VPH • PCBs • metals

3.5 Biophysical Environment

The following sections detail the environmental overview of the CTS TIMC Project for vegetation, wildlife, and fish and fish habitat.

3.5.1 Vegetation

The desktop review of ecological communities and species of conservation concern identified within the biogeoclimatic zones and regional districts that overlap the CTS TIMC Project area (i.e., the search criteria area) found a total of 69 red- or blue-listed ecological communities. The search revealed seven non-vascular and 49 vascular plants listed as provincial species of conservation concern (blue- or red-listed). Of these 56 provincially listed vascular and non-vascular species of conservation concern, 34 species are listed in Schedule 1 of the federal *Species at Risk Act* (Appendix A).

The vegetation observed at most events was dominated by non-native species common in the Metro Vancouver area (e.g., cultivated grasses, Himalayan blackberry (*Rubus armeniacus*)). Moister areas, such as ditches, were commonly dominated by phalaris grass (*Phalaris arundinacea*). No plant species of conservation concern were identified during field visits, and one blue-listed ecological community was identified during the field visits.

3.5.1.1 Pipeline Mitigation Events

The desktop review identified two events (TIL BEN 323 Event 3 and TIL BEN 323 Event 5) within 1 km of mapped red- and blue-listed ecological communities and vegetation species of conservation concern (Table 12). Two proposed events are within 1 km of critical habitat for a species listed in the *Species at Risk Act* (TIL FRA 508 Event 1 and TIL FRA 508 Event 6 are near critical habitat for streambank lupine (*Lupinus rivularis*)). Plant species indicative of one ecological community of conservation concern were observed during the field survey (the blue-listed ecological community: Labrador-Tea/ Western Bog-laurel/ Peat-moss) at TIL BEN 323 Event 3 (see overview photo in Appendix B Photo 1). No other species or ecological communities of conservation concern were observed during the field survey.

Table 12: Species and Ecological Communities of Conservation Concern

Relevant Sites (Pipeline, Event)	Species or Communities Potentially Present (Desktop)	Suitable Habitat Observed (Field Survey)	Species or Community Observed (Field Survey)
TIL BEN 323 Event 3	Vancouver Island beggarticks (*Bidens amplissima*) (blue-listed)	Yes. Ditches occur near the event.	No.
TIL BEN 323 Event 3	Labrador-Tea/Western Bog-laurel/ Peat-moss (blue-listed)	Yes.	Possible. Indicative species observed growing together in the event.
TIL BEN 323 Event 5	Vancouver Island beggarticks	Yes. Ditches occur adjacent to the event.	No species were observed in the event, but other species of beggarticks were observed (likely *Bidens tripartite*, three-parted beggarticks).
TIL FRA 508 Event 1	streambank lupine (*Lupinus rivularis*) (red-listed)	No wet or moist meadows or riverbanks observed.	No
TIL FRA 508 Event 6	streambank lupine	No wet or moist meadows or riverbanks observed.	No

Events 3 and 5 on pipeline segment TIL BEN 323 are proposed for locations on the existing FEI ROW adjacent to active agricultural activities (cranberry farming) and Burns Bog, an Ecological Conservation Area in the City of Delta. Plant species indicative of the blue-listed Labrador-Tea/ Western Bog-laurel/ Peat-moss community were observed at Event 3, but the area was considered a low integrity example of the ecological community since it lacked tree cover and a significant portion of the shrub layer included non-native plant species (highbush blueberry, *Vaccinum corymbosum*). The plant species of conservation concern, Vancouver Island beggarticks, was not observed during the field survey, but appropriate habitat is present at both Event 3 and Event 5.

The field surveys identified three events that may interact with trees (Table 13). Two of the events will occur within the drip line (as defined by the City of Surrey's Tree Protection Bylaw, 2006 No. 16100) of the observed trees.

Table 13: Potential Interactions with Trees

Relevant Sites (Pipeline, Event)	Description of Trees
TIL BEN Event 3	European birch trees (3–4) likely over-hang the proposed event. Direct measurements were not taken during the field survey due to access barrier.
LIV COQ 323 Event 9	Two large (approximately 80 cm DBH[2]) oak trees (possibly English oak, *Quercus robur*) are growing east and west of the pipeline ROW. The crown of the tree east of the ROW likely overhangs the proposed event (see Appendix B Photo 5).
HUN NIC 762 Event 41	Trees growing along the fence line of the adjacent property do not appear to overhang the proposed event.

Two species of weeds listed in Schedule A (Part 1) of the BC *Weed Control Regulation* were identified during the field survey, affecting two proposed events (Table 14). The desktop review showed two proposed events with an invasive alien plant site within 100 m (from Schedule A of the BC *Weed Control Regulation*), neither of which were observed during the field survey.

Table 14: Desktop Review and Field Survey Observations of Weeds Classified as Noxious in Schedule A of the BC Weed Regulation

Relevant Sites (Pipeline, Event)	Invasive Alien Plant Site Within 100 m (Desktop)	Observed Noxious Weeds (Field Survey)	Observation Details (species, number of individuals or infested area)
TIL BEN Event 3	garlic mustard (*Alliaria petiolate*)	scentless chamomile (*Matricaria maritima*)	1
TIL FRA 508 Event 1	N/A	Canada thistle (*Cirsium arvense*)	<5
CPH NOO 508 Events 4 & 5	Japanese knotweed (*Fallopia japonica*)	N/A	N/A

The Japanese knotweed mapped at event CPH NOO 508 Events 4 & 5 is adjacent to the Lougheed Highway (south side) and this area was not accessible during the field survey. However, a trenchless technique is proposed for this event, which would limit the interaction with this invasive weed species.

3.5.1.2 Facilities

The desktop review identified one facility (Tilbury LNG Plant) within 1 km of mapped red- and blue-listed ecological communities and vegetation species of conservation concern, Vancouver Island beggarticks. No vegetation field survey occurred at this facility, but all proposed work is within the fence line, so the CTS TIMC Project is not anticipated to interact with habitat suitable for this vegetation species of conservation concern.

[2] Diameter at breast height, measured at 1.4 m above ground level.

TWS proposed to occur outside facilities would be near trees at Noons Creek Valve Assembly, Port Mann Valve Station, and Coquitlam Regulating Station. All proposed TWS areas would occur on existing unvegetated areas currently or previously used as TWS or access.

The desktop review revealed one facility, Port Mann Valve Station, with a Schedule A noxious weed observation within 100 m (Japanese knotweed), although the observation was on the north side of the South Fraser Perimeter Road.

3.5.2 Wildlife and Wildlife Habitat

Wildlife species of conservation concern were defined as species that are either listed as blue or red in the Province of BC and/or listed on Schedule 1 of the *Species at Risk Act*. The BC Conservation Data Center query for wildlife species of conservation concern within the biogeoclimatic regions and regional districts that overlap the CTS TIMC Project events and facilities identified numerous species that may occur (Appendix C).

A focused review of information within 1 km of the CTS TIMC Project pipeline mitigation events and facilities found occurrence records for 12 wildlife species of conservation concern: three invertebrate species, one amphibian species, one bird species, one reptile species, and six mammal species (Table 15).

Table 15: Relevant Wildlife Species of Conservation Concern

Common Name	Scientific Name	Type	Conservation Status	Habitat and Distribution Summary[1]
Autumn meadowhawk	*Sympetrum vicinum*	Insect	Provincial: Blue	Lives in ponds, slow streams, and lakes with dense emergent vegetation
Georgia Basin bog spider	*Gnaphosa snohomish*	Insect	Provincial: Red Federal: SC *SARA*: S1	Bog specialist
Oregon forestsnail	*Allogona townsendiana*	Gastropod	Provincial: Red Federal: E *SARA*: S1	Known from forests in the Fraser Valley
Northern red-legged frog	*Rana aurora*	Amphibian	Provincial: Blue Federal: SC *SARA*: S1	Associated with streams, ponds, or marshes, but may also be present in moist forests
Great blue heron *fannini* subspecies	*Ardea herodias fannini*	Bird	Provincial: Blue Federal: SC *SARA*: S1	Associated with low elevation lakes, wetlands, sloughs, and estuaries. The major nesting colonies on the South Coast include: Tsawwassen, Bowen Island, Deer Lake, UBC (main campus) and West Vancouver[2].
Western painted turtle—Pacific Coast Population	*Chrysemys picta* pop. 1	Reptile	Provincial: Red Federal: T *SARA*: S1	Open water
Mountain beaver	*Aplodontia rufa*	Mammal	Provincial: Yellow Federal: SC *SARA*: S1	Most likely to be found in areas with water (surface or groundwater), well developed and firm soils, and abundant vegetation. Geographic extent not well known but found in the Fraser Valley.
Southern red-backed vole, *occidentalis* subspecies	*Myodes gapperi occidentalis*	Mammal	Provincial: Red	Coniferous or mixed forests and riparian areas and riparian forests. May also inhabit bogs and swamps[3].

Table 15: Relevant Wildlife Species of Conservation Concern

Common Name	Scientific Name	Type	Conservation Status	Habitat and Distribution Summary[1]
Townsend's mole	*Scapanus townsendii*	Mammal	Provincial: Red Federal: E *SARA*: S1	Typically found in lowland meadows, cultivated fields and floodplains. Found in medium-textured silt loam soil with good humus content. The BC population is associated with agricultural land in the Fraser Valley, likely limited to 20 km^2 in the Abbotsford/Huntingdon area (COSEWIC 2003).
Pacific water shrew	*Sorex bendirii*	Mammal	Provincial: Red Federal: E *SARA*: S1	Moist riparian habitats associated with stream sides and marshes. Typically found in forests of red alder, bigleaf maple, western hemlock, or western red-cedar that border streams and skunk-cabbage marshes. In BC it is restricted to the lower Fraser Valley.
Olympic shrew	*Sorex rohweri*	Mammal	Provincial: Red	Likely confined to the south side of the Fraser River in British Columbia from Burns Bog as far east as Depot Creek in the Chilliwack Valley. A recent discovery was in Burns Bog, Delta. Little is known about this recently described species[4].
Trowbridge's shrew	*Sorex trowbridgii*	Mammal	Provincial: Red	Most common in dry mixed and coniferous forests with rich soil and abundant decaying wood and leaf litter. Restricted in BC to the lower Fraser River valley.

NOTES:

1. Habitat and distribution information from eFauna BC (Klinkenberg 2019) unless indicated otherwise
2. Habitat and distribution information from South Coast Conservation Program (2020)
3. Habitat and distribution information from BC Conservation Data Centre (2020)
4. Habitat and distribution information from BC Conservation Data Centre (2015)

E—Endangered

SC—Special Concern

S1—listed on Schedule 1 of the *Species at Risk Act*

3.5.2.1 Pipeline Mitigation Events

Only one event overlaps with critical habitat designated under the *Species at Risk Act*: CPH NOO 508 Event 4 & 5 overlaps with western painted turtle critical habitat (see Appendix A). Although appropriate habitat was not observed at CPH NOO 508 Event 4 & 5, the entire event could not be observed directly, so the event is assumed to have the potential to affect western painted turtle critical habitat. This event, however, will occur as mostly a trenchless crossing, so direct effects to western painted turtle are not anticipated.

The following proposed events are within 3 km of critical habitat designated under the *Species at Risk Act*:

- LIV COQ 323 Event 9: Oregon Forestsnail and Western Painted Turtle—Pacific Coast Population
- HUN NIC 762 Event 36: Oregon Forestsnail
- CPH NOO 508 Event 9: Western Painted Turtle—Pacific Coast Population and Oregon Forestsnail
- CPH NOO 508 Event 14: Western Painted Turtle—Pacific Coast Population
- CPH NOO 508 Event 20: Western Painted Turtle—Pacific Coast Population
- HUN ROE 1067 Event 12: Townsend's Mole

No species of conservation concern were observed during the field surveys, although potential wildlife habitat was observed at some of the proposed events (Table 16). Seven events have potential wildlife habitat.

No forests were observed at any of the events, so appropriate habitat is not anticipated for Oregon forestsnail, Pacific water shrew, or Trowbridge's shrew. Although some events may have appropriate habitat for Townsend's mole (LIV COQ 323 Event 9 and CPH NOO 508 Event 20), the potential for Townsend's mole occurring at these sites was considered low since these sites are well outside the species' mapped critical habitat. Two events, TIL BEN 323 Event 3 and TIL BEN Event 5 would occur near Burns Bog in the City of Delta, which supports numerous species of conservation concern. The event that would occur adjacent to the bog (Event 3), has the potential to interact with wildlife species of conservation concern and their habitat (particularly autumn meadowhawk, Georgia Basin bog spider, and Olympic shrew).

Wetland habitat that may support amphibians was observed within or adjacent to three events: TIL BEN 323 Event 3, TIL BEN Event 5, and CPH NOO 508 Events 4 and 5 (see Appendix B Photo 6). No open water was observed at any proposed events. Mature, stand-alone trees adjacent to some events are likely to support nesting songbirds during the breeding season. No stick nests were observed during the field surveys. No structures or buildings were observed within or adjacent to events.

Table 16: Potential Wildlife Habitat Observed During Field Survey

Pipeline	Event	Potential Wildlife Habitat Observed
TIL BEN 323	3	Potential nesting habitat in nearby trees and shrub cover for small mammals. Bog vegetation was observed, which may be habitat for some species of conservation concern.
TIL BEN 323	5	Shrubs may provide nesting habitat for some birds. Ditches containing water during the field survey may be inhabited by amphibians. A frog carcass (likely American bullfrog, *Rana catesbeiana*) was found during the field survey.
TIL FRA 508	1	Primarily an industrial site. Weedy roadside ditch observed outside the facility. Low potential for wildlife habitat.
TIL FRA 508	6	Event entirely within a facility. Low potential for wildlife habitat.
LIV COQ 323	9	Event proposed for paved parking area, cultivated grass, and adjacent agricultural field growing hay at time of field surveys. Large trees adjacent to event may support nesting birds.
HUN NIC 762	36	Event entirely within a facility. Low potential for wildlife habitat.
HUN NIC 762	41	Event entirely within a facility surrounded by industrial activities. Adjacent trees may provide some wildlife habitat.
CPH NOO 508	1	Event entirely within a facility surrounded by industrial activities. Low potential for wildlife habitat.
CPH NOO 508	4 & 5	Wet habitat with abundant grasses and shrubs may support nesting birds, small mammals, and reptiles.
CPH NOO 508	9	This event has actively managed, cultivated grass. Nearby trees may provide some nesting habitat, but the event was considered to have low habitat potential.
CPH NOO 508	14	Event entirely within a facility. Adjacent trees may provide some wildlife habitat. Low wildlife habitat potential.
CPH NOO 508	20	Open cut areas proposed for the event is within a facility with low habitat potential. The nearby open space has the potential to support or be frequented by small mammals (e.g., moles), larger mammals (e.g., deer), and reptiles.
HUN ROE 1067	12	Event entirely within a facility surrounded by industrial activities. Low habitat potential.

3.5.2.2 Facilities

Six facilities are within 1 km of occurrence records or critical habitat for species of conservation concern (Table 17).

Table 17: Facilities with Wildlife Species of Conservation Concern Occurrence Records or Critical Habitat within 1 km

Facility	TWS Outside Facility	Species of Conservation Concern or Critical Habitat
Livingston Regulating Station	No	Northern red-legged frog
Nichol Valve Station	Yes	Northern red-legged frog
Benson Regulating Station	No	Olympic shrew
Roebuck Valve Assembly	No	Pacific water shrew
Noons Creek Valve Assembly	Yes	Western painted turtle—Pacific Coast Population (proposed critical habitat)
Huntingdon Control Station	No	Western painted turtle—Pacific Coast Population (proposed critical habitat)

Livingston Regulating Station is within 1 km of a northern red-legged frog occurrence record. However, since no work is proposed outside the facility, work is not anticipated to interact with this species. Both Nichol Valve Station and Noons Creek Valve Assembly have TWS proposed outside the facility, but suitable habitat for species of conservation concern is not anticipated to occur within the TWS areas. Huntingdon Control Station is within 1 km (200 m) of proposed critical habitat for western painted turtle. However, since work is only proposed to occur within the facility, it is not anticipated to interact with this species.

Table 18 presents a description of the potential wildlife habitat associated with each facility. Three facilities or their adjacent areas have some wildlife habitat: Port Mann Valve Station, Noons Creek Valve Assembly, and Huntingdon Control Station.

Table 18: Potential Wildlife Habitat Associated with Facilities

Facility	TWS Outside Facility	Potential Wildlife Habitat*
Benson Regulating Station	No	Nearby ditch may provide wildlife habitat, although the facility location within highway interchanges reduces the quality of any available habitat. Low habitat potential.
Tilbury LNG Plant	No	The facility is a large industrial site with low habitat potential.
Tilbury Regulating Station	Yes (same site as TIL FRA 508 Event 1)	An industrial site with low habitat potential. Weedy roadside ditch observed outside the facility. Low potential for wildlife habitat.
Fraser Gate Station	No	An industrial site with low habitat potential.
Nichol Valve Station	Yes	The vegetated areas that would be used for TWS appear to be maintained grass and a cedar hedge, which likely have low habitat potential.
Port Mann Valve Station	Yes	Proposed areas for TWS were recently disturbed in 2017 for the FEI CTS Project. Adjacent trees may provide bird nesting habitat. Adjacent ditches are unlikely to provide suitable amphibian habitat.
Roebuck Valve Station	No	Areas outside this facility appear to be maintained grass and weedy riparian areas with low habitat potential.
Cape Horn Regulating Station	Yes (same event at CPH NOO 508 Event 1)	This facility and its TWS are within a high-density industrial area with low habitat potential.
Coquitlam Regulating Station	Yes (same site as CPH NOO 508 Event 14)	This facility is within an urban area and proposed TWS is existing access road or sidewalk. Nearby trees on residential properties may provide nesting habitat.
Noons Creek Valve Assembly	Yes	Proposed TWS would be on existing access areas, but adjacent parkland may provide nesting habitat for birds.
Anmore Regulating Station	No	Areas outside this facility appear to be maintained grass and hedges with low habitat potential t.
Livingston Regulating Station	No	Work is proposed to occur within the existing facility with low habitat potential. Adjacent trees may provide bird nesting habitat.
Huntingdon Control Station	No	Work would occur entirely within the facility fence line, so no work would occur in the nearby watercourse and wetland outside this facility. The meter building at the facility that requires modifications may provide habitat for nesting birds or bats.
NOTE: *Potential wildlife habitat description based on desktop review, except for the areas adjacent to Tilbury Regulating Station and Coquitlam Regulating Station which were field surveyed (see Section 3.5.2.1)		

3.5.3 Fish and Fish Habitat

The desktop review identified two fish species of conservation concern that occur within 1 km of pipeline mitigation events or facilities (Table 19). Work in the vicinity of the Fraser River, where white sturgeon (*Acipenser transmontanus*) is found in the region, is limited to within the fence line of Fraser Gate Station, approximately 12 m from the river, and Tilbury LNG Plant, approximately 25 m from the river. No works are anticipated near watercourses that contain Salish sucker (*Catostomus* sp. 4).

Table 19: Results of Spatial Desktop Search for Fish Species of Conservation Concern

Common Name	Scientific Name	Type	Conservation Status	Habitat and Distribution Summary[1]
White Sturgeon (Lower Fraser River Population)	*Acipenser transmontanus* pop. 4	Fish	Provincial: Red Federal: SC	Marine species that is known to spawn in the Fraser River.
Salish Sucker	*Catostomus* sp. 4	Fish	Provincial: Red COSEWIC: SC *SARA*: S1	Inhabits small lakes and stream headwaters. Species has a restricted and fragmented range in southwestern BC.

Details of all fish and fish habitat (including species of conservation concern) are discussed separately for pipeline mitigation events and facilities in the following sections.

3.5.3.1 Pipeline Mitigation Events

Based on the desktop review of provincial and municipal sources, a total of five events are within 30 m of a watercourse (e.g., stream, ditch or wetland). One event (TIL FRA 508 Event 6) is approximately 10 m from a ditch with a low risk to fish and fish habitat values (Table 20) and would occur entirely within a FEI facility, so aquatic field surveys did not occur at this event.

Table 20: Desktop Review of Aquatic Resources for Pipeline Mitigation Events

Relevant Event	Distance to Watercourse or Wetland	Watercourse Type	Classification[1] (Municipal Classification)	Field Assessment?
TIL BEN 323, Event 3	10 m from Burns Bog Ecological Conservancy Area Approximately 5 m from ditches	Wetland, ditches	S4 (N/A)	Yes
TIL BEN 323, Event 5	Approximately 2 m	Ditch	S4 (N/A)	Yes
TIL FRA 508, Event 6	Approximately 12 m	Ditch	Estimated S3 (N/A)	No—Event within facility

Table 20: Desktop Review of Aquatic Resources for Pipeline Mitigation Events

Relevant Event	Distance to Watercourse or Wetland	Watercourse Type	Classification[1] (Municipal Classification)	Field Assessment?
CPH NOO 500, Event 4 & 5	0 m. Trenchless crossing beneath ditches and potential wetland.	Ditches, wetland	Ditch south of Lougheed Highway: Estimated S3 due to potential for fish Ditch north of Lougheed Highway Estimated S3 (Unknown fish presence)	Yes
CPH NOO 500, Event 20	Approximately 15 m	Ditch	NCD (Unknown fish presence)	Yes
NOTE: 1. Watercourse classification as described in Table 5				

The desktop review identified two events within 10 m of a watercourse on TIL BEN 323 (Event 3 and Event 5).

- Event 3 is approximately 10 m from the Burns Bog Ecological Conservancy Area and was viewed from behind a fenced area. No channels were observed; however, a grassy corridor was observed approximately 10 m south of Event 3 which led to open water within Burns Bog. Unmapped ditches are present on both sides of the ROW and are crossed by a vehicle bridge (see Appendix B Photo 2). The ditches may be used in active farming to convey water from the fields to nearby sloughs, and ultimately to the Fraser River. No works in Burns Bog or the ditches is anticipated, so this event is considered low risk to fish and fish habitat values.
- Event 5 is located on a vegetated 'island', surrounded by unmapped ditches immediately west and north of the proposed event (see Appendix B Photos 3 and 4). Fish habitat is poor because the water is stagnant, and the substrate consists of fines and organics. Duckweed (*Lemna* sp.) covers the surface of the ditches and riparian vegetation is primarily grasses. The ditches flow to the west, connecting with other agricultural ditches in the area, which have recorded observations of threespine stickleback (*Gasterosteus aculeatus*), largescale sucker (*Catostomus macrocheilus*), carp (*Cyprinus carpio*), pumpkinseed (*Lepomis gibbosus*), and largemouth bass (*Micropterus salmoides*) (BC MOECCS 2020b). The City of Delta mapping (2020) does have instream works windows associated with the ditches in the vicinity of Event 5 or the mapped ditches they flow into. Based on the low gradient and connectivity of the ditches, they are assumed to be fish-bearing. Culvert installation within the ditches may be required as part of works, and thus the event is considered to have moderate risk to fish and fish habitat values.

Two events on CPH NOO 500 have watercourses associated with them: Event 4 & 5 and Event 20.

- Event 4 & 5 crosses mapped ditches on the north and south sides of Lougheed Highway and a potential wetland area was observed near the north end of the proposed event (see Appendix B Photo 6). The City of Coquitlam (2020) classifies the south ditch as potentially fish-bearing and the north ditch as unknown fish presence. The ditches are connected via a culvert beneath Lougheed Highway. Access to the area around the south ditch was restricted, as it is between an active railway and the highway. Vegetation such as cattails (Typha sp.) and hardhack (*Spiraea douglasii*) were present at the north end of Event 4 & 5, indicating a wetland. City of Coquitlam mapping (2020) indicates the presence of an intermittent stream in the wetland area, south of Event 4 & 5, with unknown fish presence. Both this watercourse and the ditches on either side of Lougheed Highway appear to have connectivity to a wetland area to the east with known observations of coho salmon (*Oncorhynchus kisutch*), chum salmon (*Oncorhynchus keta*), cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), and other fish species (City of Coquitlam 2020, BC MOECCS 2020b). Event 4 & 5 will be completed through trenchless methods, so no disturbance of the watercourses in the area is anticipated and this event is considered to have low risk to fish and fish habitat values.
- City of Coquitlam mapping indicates there is a ditch with unknown fish presence approximately 15 m northeast and upslope of CPH NOO 500 Event 20 (City of Coquitlam 2020). The ditch flows into the storm system. The field reconnaissance did not observe any watercourses in the vicinity of Event 20 that would be impacted by the Project and thus this event has a negligible risk to fish and fish habitat values.

3.5.3.2 Facilities

Except for six facilities with a TWS, all work at facilities would be within the fence line. Based on the desktop review of provincial and municipal sources, six locations with facility work are within 30 m of a watercourse (e.g., stream, ditch or wetland).

Table 21 summarizes the six facilities that have watercourses within 30 m of the fence line or TWS. Port Mann Value Station has a watercourse within 10 m of a TWS while the remaining TWSs are more than 30 m from watercourses. Roebuck Valve Station, Nichol Valve Assembly, and Livingston Regulating Station have watercourses within 10 m of the fence line. The remaining facilities are considered low risk to fish and fish habitat and are not discussed further, as they are greater than 10 m from a watercourse with works occurring entirely inside the facility.

Table 21: Desktop Review of Aquatic Resources for Facilities

Relevant Facility	Distance to Watercourse or Wetland	Watercourse Type	Classification[1] (Municipal Classification)	Field Assessment?
Roebuck Valve Station	Healy Creek—approximately 20 m Southwest stream—approximately 4 m Northeast ditch—approximately 2 m	Streams, Ditch	Healy Creek estimated S4 (Class A) Stream southwest of facility estimated S6 (Class B) Ditch northeast of facility estimated S6 (Class B)	No—Event within facility
Fraser Gate Station	Approximately 12 m from Fraser River	Stream	S1A (Class A)	No—Event within facility
Tilbury LNG Plant	Approximately 25 m from Fraser River	Stream	S1A (Class A)	No—Event within facility
Port Mann Valve Station	Approximately 1 m from TWS	Ditch	NCD (Class C)	No
Nichol Valve Assembly	Approximately 5 m	Dry Detention Pond	NCD (Class C)	No—Event within facility and TWS no in vicinity
Livingston Regulating Station	Approximately 5 m	Ditch	NCD (Class C)	No—Event within facility

NOTES:
1. Watercourse classification as described in Table 5
Class A—provides year-round habitat for fish
Class B—provides valuable food and nutrients for fisheries watercourses but does not support fish
Class C—Insignificant food and nutrients for fisheries watercourses and does not support fish

The desktop review identified four facilities that have a watercourse within 10 m of a facility fence line or TWS:

- Roebuck Valve station is within 30 m of three watercourses. Healy Creek is approximately 25 m east, an unnamed stream is approximately 4 m southwest, and a ditch is approximately 2 m northeast of the facility fence line. Works will be occurring on the west side of this facility, more than 20 m from any of these watercourses. Due to the distance between the works and the watercourses, risk to fish and fish habitat is low.
- A TWS associated with Port Mann Valve station is approximately 1 m south of a ditch that the City of Surrey (2020) classifies as providing insignificant food and nutrients for fisheries watercourses and does not support fish (i.e., Class C). The ditch is located between the facility and Highway 17 and flows east into a fish-bearing watercourse north of the highway though the stormwater system. Based on COSMOS mapping, the ditch is 80 m long and originates immediately west of Port Mann Valve Station (City of Surrey 2020). It likely only conveys water runoff from the Highway 17 and the area immediately around the facility during rain events. As such, the risk to fish and fish habitat is low.

- Nichol Valve Assembly is approximately 5 m southeast of a dry detention pond that the City of Surrey (2020) classifies as providing insignificant food and nutrients for fisheries watercourses and does not support fish (i.e., Class C). The pond receives flow from the stormwater system and does not appear to have an outlet or connectivity to fish habitat (City of Surrey 2020). Due to the lack of connectivity to fish habitat and as work will be restricted to within the facility and at a TWS to the south of the facility, the risk to fish and fish habitat is low.
- Livingston Regulating Station is approximately 5 m west of a ditch that the Township of Langley (2020) classified as providing insignificant food and nutrients for fisheries watercourses and has no documented fish presence (i.e., Class C). The ditch flows south along 232 Street, entering a fish-bearing (Class A) watercourse approximately 225 m downstream. It likely only conveys water from road runoff and the area immediately surrounding the ditch during rain event. Due to the classification of the ditch and as work will be restricted to within the facility, the risk to fish and fish habitat is low.

4.0 Regulatory Overview

This section lists and describes the legislation, regulation, and bylaws that are likely to apply to the CTS TIMC Project. A summary of regulatory requirements for each event is provided in Section 6.0.

4.1 Federal Legislation

4.1.1 Fisheries Act

The Canadian *Fisheries Act* protects fish and fish habitat throughout Canada. A request for review may be required for activities occurring in or adjacent to watercourses or waterbodies that could result in harmful alteration, disruption or destruction of fish habitat. A request for review may not be required if the activities for a project can follow the measures to protect fish and fish habitat. Additionally, if a project falls within specific standards and codes of practice, a notification is required (but not a request for project review).

If death of fish or the harmful alteration, disruption or destruction of fish habitat will likely result from a project, there is a requirement to obtain an authorization from the Minister of Fisheries, Oceans and the Canadian Coast Guard as per Paragraph 34.4(2)(b) or 35(2)(b) of the *Fisheries Act* Regulations.

A *Fisheries Act* Request for Review may be required for work near the one fish-bearing watercourses or watercourses connected to fish habitat (TIL BEN Event 5).

4.1.2 Migratory Bird Convention Act

The *Migratory Birds Convention Act* protects species of migratory birds in Canada by prohibiting the taking of migratory bird nests and the deposition of harmful substances in waters or areas used by migratory birds. Since the BC *Wildlife Act* protects most bird species, including migratory birds, recommended mitigation measures pursuant to the *Wildlife Act* and requirements under the *Wildlife Act* are anticipated to encompass the requirements of the *Migratory Bird Convention Act*.

4.1.3 Species at Risk Act

The federal *Species at Risk Act* provides legal protection for wildlife species at risk. The Act establishes Schedule 1, which is the official list of wildlife species at risk. The Act prohibits killing, harming, harassing, taking, and possessing endangered, threatened, and extirpated species listed in Schedule 1. The prohibitions apply to federal lands or lands under the authority of some federal agencies, all migratory birds listed in Schedule 1 and the *Migratory Birds Convention Act*, and all endangered, threatened, and extirpated aquatic species listed in Schedule 1 anywhere they occur (Government of Canada 2020).

4.2 Provincial Legislation

4.2.1 Environmental Management Act

Contamination in BC is governed by the *Environmental Management Act* (the Act), administered by the Ministry of Environment and Climate Change Strategy (BC ENV) via the BC Contaminated Sites Regulation (CSR). The Act and CSR set out general principles for identification, assessment, and remediation of contaminated sites. These principles include liability for contaminated sites. With certain exceptions, both current and former owners and operators of sites are considered absolutely, retroactively, and jointly and separately liable for remediation costs, which include site investigation costs.

In BC, a contaminated site is defined as an area of land in which the soil or underlying groundwater, soil vapour, or sediment contains a prescribed substance in quantities or concentrations exceeding prescribed risk-based or numerical criteria, standards, or conditions. Specific provisions are set out in the CSR, B.C. Reg. 375/96 including 13 stages of amendments up to B.C. Reg. 13/2019, January 24, 2019) which is the enabling regulation of the Act with respect to contaminated sites.

The CSR numerical soil standards are divided into the categories of matrix numerical standards (Schedule 3.1 Part 1) and generic numerical standards (Schedule 3.1 Part 2 and Part 3). Generic standards are intended to protect human and ecological health at any site without consideration of site-specific factors other than land use.

The matrix numerical standards are applied according to land use (wildlands, agricultural, urban park, residential, commercial or industrial), and also according to site-specific factors, which include: (human) intake of contaminated soil; toxicity to soil invertebrates and plants; livestock ingesting soil and fodder; major microbial functional impairment; groundwater used for drinking water; groundwater flow to surface water used by aquatic life (freshwater and marine); groundwater used for livestock watering; and groundwater used for irrigation watering.

The CSR specifies groundwater standards for drinking, aquatic life, irrigation and livestock watering water uses. The CSR contains requirements to ensure that groundwater at a site is suitable for current and future uses and is of adequate quality to protect adjacent water uses. Applicable groundwater standards are determined in accordance with the BC ENV Protocol 21 for Contaminated Sites Water Use Determination (P21) (BC ENV 2017).

4.2.2 *Wildlife Act*

The BC *Wildlife Act* protects many vertebrate animal species from direct harm, except where allowed by regulation. Salvage of wildlife from harm that may occur during construction activities, such as those that would occur for the CTS TIMC Project, requires a permit under section 19 of the Act. The *Wildlife Act* also protect birds, nests, and eggs.

A general wildlife permit is expected to be required for wildlife (e.g., amphibians and reptiles, if required) salvage at some proposed events for the CTS TIMC Project to avoid contravening the *Wildlife Act.* Pre-construction nest surveys are also recommended for events near potential bird nesting habitat. Subsequent setbacks and alterations of work timing may be recommended by a qualified professional to avoid the incidental take of a bird nest (i.e., nest abandonment), which is prohibited by the *Wildlife Act*.

4.2.3 *Water Sustainability Act*

BC's *Water Sustainability Act* (*WSA)* provides the regulatory framework for managing the diversion and use of water resources throughout BC. This Act is complex legislation with four current regulations and more regulations proposed for the future. Section 11 of the *WSA* requires approval for making "changes in and about a stream." It is anticipated that the CTS TIMC Project will require approval under section 11 of the *WSA* from the BC Oil and Gas Commission for the following events: CPH NOO 508 Event 4 & 5 and TIL BEN Event 3 and Event 5.

4.2.4 *Agricultural Land Commission Act*

The *Agricultural Land Commission Act* sets the legislative framework for the establishment and administration of agricultural land preservation in BC (Provincial Agricultural Land Commission 2014). In the Act, land is designated in the ALR. Four events and two facilities are proposed to occur in the ALR, although two of the events are entirely within facilities. Soil handling methods to maintain the agricultural capability is recommended for the four events outside facilities within the ALR.

Soil management will be required for three sites (LIV COQ Event 9 and TIL BEN Event 3 and Event 5) that will occur in the ALR to preserve agricultural capability of the soil. It is understood that although HUN ROE Event 12, Huntingdon Control Station, and Benson Regulating Station are within the ALR, they will be excavated using hydrovac, as machine excavation in facilities is not practical. It is assumed that a single application to the Agricultural Land Commission (ALC) for the use of fill will be required as, cumulatively, import fill will be more than 1,000 m³ for events within the ALR.

4.3 Regional District Bylaws

There are no directly applicable regional bylaws for the CTS TIMC Project from the Metro Vancouver Regional District or the Fraser Valley Regional District.

4.4 Municipal Bylaws

Municipal bylaws have been reviewed for their applicability to the proposed events for the CTS TIMC Project and are summarized below.

4.4.1 Corporation of Delta

Five Corporation of Delta bylaws were reviewed for the CTS TIMC Project.

4.4.1.1 Tree Protection

The Corporation of Delta's Tree Protection Bylaw (No. 7415) prohibits the cutting or damaging of a tree (defined as greater than or equal to 20 cm dbh), including activities in the dripline, that could compromise or cause the death of the tree. Work for the CTS TIMC Project is anticipated to be exempt from this bylaw since it exempts construction or maintenance of a public utility in an easement.

4.4.1.2 Soil Deposit and Removal

The Delta Soil Deposit and Removal Bylaw, no. 7221 prohibits soil deposition or removal from any land in Delta without a permit, although a volume less than 30 m^3 in a 12-month period is exempt. Soil removal will be required at three facilities in the City of Delta where hydrovacing is required (Benson Regulating Station, Tilbury LNG Plant, and Tilbury Regulating Station (also TIL FRA 508 Event 1)), so permits under this bylaw are expected to be required by the CTS TIMC Project.

4.4.1.3 Waterway Protection

The Corporation of Delta's Waterway Protection Bylaw (no. 1615) prohibits the pollution, obstruction, or impediment of waterways, including ditches, drains, and sewers. The bylaw also prohibits cutting, destruction, or injuring a dike or other drainage. The CTS TIMC project is not anticipated to obstruct or pollute waterways and water and wastewater infrastructure; best management practices for soil and erosion control are expected to be implemented.

4.4.1.4 Noise

The Noise Control Bylaw (no. 1906) prohibits construction noise on specific times and days. The CTS TIMC Project is anticipated to adhere to the construction timing requirements in this bylaw.

4.4.1.5 Weeds

The Noxious Weed Destruction Bylaw (no. 141) requires landowners to destroy noxious weeds each year. The list of weeds in the bylaw includes some weeds not listed in Schedule 1 of the BC *Weed Control Regulation*. The weeds listed in this bylaw were not observed at the events in Delta, so this bylaw is not expected to apply to the CTS TIMC Project.

4.4.2 City of Vancouver

Three City of Vancouver bylaws are considered relevant to the CTS TIMC Project.

4.4.2.1 Tree Protection

The City of Vancouver's Protection of Trees Bylaw (no. 9958) prohibits cutting, killing or relocating a tree, expect if exempt by the bylaw or in compliance with a tree permit. The bylaw does not apply to trees on public utility easements or statutory ROW, so the CTS TIMC Project is considered exempt from this bylaw.

4.4.2.2 Noise

The City of Vancouver's Noise Control Bylaw (no. 6555) restricts noise to specific levels and in certain zones. It also restricts construction activities to specific times and days. The CTS TIMC Project is anticipated to adhere to the construction timing requirements in this bylaw.

4.4.2.3 Waterway Protection

Waterways in the City of Vancouver are protected in the Sewer and Watercourse Bylaw (no. 8093) from discharges, pollution, and obstructions. The CTS TIMC Project is not anticipated to discharge to the stormwater system or waterways; best management practices for soil and erosion control are expected to be implemented.

4.4.3 City of Richmond

4.4.3.1 Tree Protection

The City of Richmond's Tree Protection Bylaw (no. 8057) prohibits cutting or removing a tree (greater than or equal to 20 cm dbh and capable of reaching a height of 4.5 m) and physical damage to a tree by placing materials or damaging substances within the dripline. No damage or removal of trees within the City of Richmond is anticipated for the CTS TIMC Project.

4.4.3.2 Soil Removal and Deposition

The City of Richmond regulates the removal of soil and the deposition of soil and fill materials through its Soil Removal and Fill Deposit Regulation (bylaw no. 8094). This bylaw only applies to the ALR. The CTS TIMC Project's one event proposed in the City of Richmond is not in the ALR. Additionally, the bylaw does not apply to maintenance of a statutory ROW.

4.4.3.3 Pollution Prevention

Any discharges (including those that are potentially polluting) are regulated through the City of Richmond's Pollution Prevention and Clean-up Bylaw (no. 8475). Some discharges of non-stormwater to the drainage system may be allowed through an application and permit system. The CTS TIMC Project is anticipated to employ erosion and sediment control (ESC) measures and safe storage and handling of any substances (if applicable) to manage any potential discharge from the proposed event.

4.4.3.4 Watercourse Protection

The City of Richmond's Watercourse Protection and Crossing Bylaw (no. 8441) prohibits a range of actions that may affect watercourses, including pollution, obstruction, impediments, crossings, and riparian development. No watercourses are near the CTS TIMC Project proposed event in the City of Richmond, so permits required by this bylaw are not expected to be applicable to the CTS TIMC Project. Additionally, best management practices for ESC are expected to be implemented to manage the potential for release of substances from the event to waterways or waterworks.

4.4.3.5 Noise

Permissible noise levels are detailed in the City of Richmond's Noise Regulation (no. 8856). The CTS TIMC Project is anticipated to adhere to the rating level and time restrictions established in the Noise Regulation.

4.4.4 City of Surrey

Six City of Surrey bylaws considered relevant for the CTS TIMC Project.

4.4.4.1 Tree Protection

The City of Surrey's Tree Protection Bylaw (no. 16100) protect trees (defined as greater than or equal to 30 cm dhb) from cutting, removal, or damage. The bylaw exempts tree cutting completed pursuant to the *Pipeline Act* (now the *Oil and Gas Activity Act*), so work for the CTS TIMC Project is anticipated to be exempt from this bylaw.

4.4.4.2 Noise

The Noise Control Bylaw (no. 7044) prohibits disruptive noise and restricts construction noise to specific times and days. The CTS TIMC Project is anticipated to adhere to the construction timing requirements in this bylaw.

4.4.4.3 Weeds

The provisions in the City of Surrey's Noxious Weeds Bylaw (no. 91) essentially aligns the bylaw with provincial weed legislation. The CTS TIMC Project is expected to comply with this bylaw.

4.4.4.4 Erosion and Sediment Control

Discharge of sediment or sediment-laden water into the drainage system exceeding the turbidity limit is prohibited by the City of Surrey's Erosion and Sediment Control Bylaw (no. 16138). Proposed construction on land greater than 2,000 m^2 requires submission of an ESC permit. Since the CTS TIMC Project is not anticipated to exceed this area of land, an ESC permit application is not anticipated to be required.

4.4.4.5 Soil Conservation

Soil deposition and removal are regulated by the City of Surrey's Soil Conservation and Protection Bylaw (no. 16389). A Notice of Intent is required for removal or deposition of soil volumes from 15–100 m^3. Volumes greater than 100 m^3 require additional submissions, including an ESC plan. A permit for soil removal is anticipated to be required for three facilities in the City of Surrey in which hydrovac soil removal is required and volumes are estimated to exceed 100 m^3 (Nichol Valve Station, Roebuck Valve Station, and Port Mann Valve Station).

4.4.4.6 Stormwater Drainage

Although this bylaw (Surrey Stormwater Drainage Regulation and Charges Bylaw (no. 16610)) has many parts, the most relevant section to the CTS TIMC Project is the prohibition of fill placement or soil movement to interfere with drainage and cause flooding. The CTS TIMC Project will adhere to this bylaw by re-establishing natural drainage after Project activities.

4.4.5 Township of Langley

Five bylaws in the Township of Langley are deemed relevant to the CTS TIMC Project.

4.4.5.1 Community Standards

The Township of Langley includes weed control requirements and noise restrictions in its Community Standards Bylaw (no. 5448). The CTS TIMC Project will adhere to the noise timing restrictions and noxious weed control will be implemented where required.

4.4.5.2 Tree Protection

The Township of Langley's Tree Protection Bylaw (No. 5478) prohibits the cutting or removal of trees (defined as greater than or equal to 30 cm dbh) and prohibits various activities within the dripline that may damage a tree. A tree permit is expected to be required for one event where work will likely occur within the dripline of adjacent trees (LIV COQ 323 Event 9).

4.4.5.3 Soil Deposition and Removal

The Township of Langley's Soil Deposit and Removal Bylaw (no. 4975) prohibits the removal and deposition of soil and other materials within the Township. A permit under this bylaw may be required at one event (LIV COQ 323 Event 9) if soil removal and/or deposition is required (e.g., removal of soil for hydrovacing around tree roots and deposition of materials to replace removed soil). A permit will likely be required for removal of soil at one facility (Livingston Regulating Station) as hydrovacing is required for work in the facilities.

4.4.5.4 Erosion and Sediment Control

Erosion and sediment discharges are regulated in the Township of Langley by the Erosion & Sediment Control Bylaw (no. 4381). The bylaw restricts the turbidity of water entering the drainage system and requires an ESC permit for developable areas greater than 2,000 m^2. An ESC permit is not expected to be required for the CTS TIMC Project since the land area will be small for each event and the Project will employ ESC best management practices.

4.4.5.5 Watercourse Protection

The Watercourse Protection Bylaw (no. 4964) prohibits the indirect or direct release of prohibited materials into a watercourse. Prohibited material release is not anticipated with the CTS TIMC Project and best management practices for ESC are expected to be implemented, especially near watercourses.

4.4.6 City of Port Moody

Three City of Port Moody bylaws may be applicable to the CTS TIMC Project.

4.4.6.1 Tree Protection

The City of Port Moody protects trees through its Tree Protection Bylaw (no. 2961). Tree cutting or removal by a utility on land owned or held by the utility for safety, maintenance, or operations are exempt from the bylaw; therefore, the CTS TIMC Project is expected to be exempt.

4.4.6.2 Soil Deposition and Removal

The City of Port Moody's Site Alteration Bylaw prohibits the deposition of soil or site clearing without a permit, unless exempt from the bylaw. These activities are exempt from the bylaw if they are conducted on behalf of a utility provider, so the CTS TIMC Project is expected to be exempt from the requirements of this bylaw.

4.4.6.3 Pesticides

The Pesticide Use Control Bylaw in the City of Port Moody restricts the type of pesticides that can be used through a list of permitted pesticides, expect for the control of some noxious weeds. If weed control will be required to remove noxious weeds at one facility in the City of Port Moody, it is expected to be conducted in compliance with this bylaw.

4.4.7 City of Coquitlam

Five City of Coquitlam bylaws were considered applicable to the CTS TIMC Project.

4.4.7.1 Tree Protection

The City of Coquitlam's Tree Management Bylaw (no. 4091) prohibits cutting and damage to trees (defined as greater than or equal to 20 cm dbh) without a permit. Cutting or removal of protected trees for the maintenance and operation of a utility's infrastructure is exempt from obtaining a tree permit, so the CTS TIMC Project is anticipated to be exempt from this bylaw.

4.4.7.2 Soil Removal and Deposit

Soil removal and deposition on lands within the City of Coquitlam is prohibited by the Soil Removal and Deposit Regulation (no. 1914) without a permit. Permits are specifically required for removal of soil from the City's defined Soil Substance Areas to outside a Soil Substance Area. Soil removal in the City of Coquitlam will be required by the CTS TIMC Project for hydrovacing at facilities (Cape Horn Regulating Station (CPH NOO 508 Event 1), Coquitlam Regulating Station (CPH NOO 508 Event 14), and Noons Creek Valve Station), but these areas are not within the designated Soil Substance Areas, so a permit is not anticipated to be required.

4.4.7.3 Stream and Drainage Protection

The City of Coquitlam's Stream and Drainage System Protection Bylaw (no. 4403) prohibits the release of deleterious substances into waterways or the drainage system and impeding or obstructing flow in drainage systems. The bylaw specifies the pH range and turbidity level that cannot be exceeded. An ESC plan is required for development applications. The CTS TIMC Project is anticipated to employ ESC; the Project does not meet the definition of a development in the bylaw, so submission of an ESC plan to the City of Coquitlam is not expected to be required.

4.4.7.4 Noise

The Noise Regulation Bylaw (no. 1233) prohibits the disruptive noise and restricts construction activities to specific times and days. The CTS TIMC Project is anticipated to comply with the construction timing required in this bylaw.

4.4.7.5 Weeds

Only one weed, giant hogweed (*Heracleum mantegazzianumi*), is regulated in the City of Coquitlam's Noxious Weed Bylaw (no. 4181). Since this weed was not observed at any CTS TIMC Project events, this bylaw is not anticipated to apply to the Project.

4.4.8 Village of Anmore

Five Village of Anmore bylaws were deemed applicable to the CTS TIMC Project.

4.4.8.1 Tree Protection

The Village of Anmore's Tree Management Bylaw (no. 587) prohibits cutting or damaging trees (defined as 20 cm or more DBH) without a valid permit. Work proposed in the Village of Anmore for the CTS TIMC Project would be within the fence line of Anmore Regulating Station, therefore no trees are expected to be affected.

4.4.8.2 Watercourse Protection

The Village of Anmore has two bylaws that protect watercourses: Sedimentation and Discharge Control Bylaw (no. 309) and Erosion and Sediment Control Bylaw (no. 547). The first bylaw prohibits fouling and obstruction of the drainage system (includes natural watercourses as defined in the bylaw) and it requires a Sediment Control Plan for construction near a drainage system or on erodible lands. The latter bylaw prohibits the discharge of sediment and sediment-laden water above a specified threshold. It requires an ESC Permit and accompanying ESC plan for construction on lands greater than 2,000 m^2. The CTS TIMC Project is anticipated to employ ESC; the only proposed CTS TIMC Project in the Village of Anmore (Anmore Regulating Station) would not exceed the area threshold for submission of an ESC Permit to the Village of Anmore.

4.4.8.3 Soil Deposition

The Village of Anmore's Soil Deposit Bylaw (no. 81) prohibits the deposition of soil. The bylaw also prohibits damage to the drainage system and aquifers and emissions of nuisance dust and noise. No below ground work is anticipated at Anmore Regulating Station, therefore soil deposition is not anticipated for the CTS TIMC Project in the Village of Anmore.

4.4.8.4 Noise

The Village of Anmore's Noise Control Bylaw (no. 417) prohibits disturbing noise and restricts construction activities to specific days of the week and times of day. The CTS TIMC Project is anticipated to comply with the construction timing required in this bylaw.

4.4.9 City of Abbotsford

Four bylaws were considered relevant in the City of Abbotsford to the CTS TIMC Project.

4.4.9.1 Tree Protection

The City of Abbotsford's Tree Protection Bylaw (no. 1831) prohibits cutting trees (defined as greater than and equal to 4 m in height and 20 cm dbh) and damage to trees, including activities or placing materials within the dripline. The bylaw exempts removal of trees by a public utility for safety, maintenance, or operation of its services or infrastructure, so the bylaw would exempt work for the CTS TIMC Project. Additionally, no tree removal or potential damage is anticipated at the one event in the City of Abbotsford (HUN ROE 1067 Event 12).

4.4.9.2 Erosion and Sediment Control

The discharge of sediment and sediment-laden water is restricted by the City of Abbotsford's Erosion and Sediment Control Bylaw (no. 1989). Turbidity limits are detailed in the bylaw. An ESC permit is required for developments on land exceeding 2,000 m^2. The CTS TIMC Project is anticipated to employ best management practices for ESC. The one proposed event in the City of Abbotsford is expected to have a land area below the requirement for an ESC permit.

4.4.9.3 Soil Removal and Deposition

Actions of soil removal and deposition of soil and other fill materials are regulated in the City of Abbotsford by the Soil Removal and Deposit Bylaw (no. 1228). This bylaw also prohibits the obstruction or damage to the drainage system, watercourses, or groundwater aquifers. Removal and deposition of soil and other materials for construction or installation of public services on a statutory ROW is exempt from this bylaw, which likely exempts the CTS TIMC Project events and facilities from a permit. Additionally, best management practices for ESC are expected to be implemented to manage potential release of sediment or sediment-laden water.

4.4.9.4 Waterways

Streamside protection and enhancement areas are established and protected through the City of Abbotsford's Streamside Protection Bylaw (no. 1465). The one CTS TIMC Project proposed to occur in the City of Abbotsford is not within a streamside protection and enhancement area, so this bylaw is not considered applicable to the CTS TIMC Project.

Table 22: Summary of Municipal Bylaws Applicable to the CTS TIMC Project

Municipality	Applicable Bylaws[1]						
	Tree Protection	**Erosion and Sediment Control**	**Soil Removal and Deposition**	**Drainage System Protection**	**Watercourse Protection/ Pollution Prevention**	**Weeds and Pesticides**	**Noise**
Corporation of Delta	-	-	Benson Regulating Station Tilbury LNG Plant Tilbury Regulating Station (TIL FRA 508 Event 1) ESC measures will be in place.	N/A	N/A	-	The CTS TIMC Project will adhere to construction timing restrictions.
City of Vancouver	-	N/A	N/A	No permit required. ESC measures will be in place.	No permit required. ESC measures will be in place.	-	The CTS TIMC Project will adhere to construction timing restrictions.
City of Richmond	-	N/A	-	N/A	No permit required. ESC measures will be in place.	N/A	The CTS TIMC Project will adhere to construction timing restrictions.
City of Surrey	-	No permit required. ESC measures will be in place.	Nichol Valve Station Roebuck Valve Station Port Mann Valve Station	Natural drainage will be re-established after Project activities.	N/A	-	The CTS TIMC Project will adhere to construction timing restrictions.
Township of Langley	LIV COQ 323 Event 9	No permit required. ESC measures will be in place.	LIV COQ 323 Event 9 Livingston Regulating Station	N/A	ESC measures will be in place.	The CTS TIMC Project will control weeds.	The CTS TIMC Project will adhere to construction timing restrictions.
City of Port Moody	-	N/A	-	N/A	N/A	The CTS TIMC Project will adhere to pesticide restrictions, if required.	N/A
City of Coquitlam	-	N/A	-	N/A	No permit required. ESC measures will be in place.	-	The CTS TIMC Project will adhere to construction timing restrictions.
Village of Anmore	-	No permit required. ESC measures will be in place.	-	No permit required. ESC measures will be in place.	No permit required. ESC measures will be in place.	N/A	The CTS TIMC Project will adhere to construction timing restrictions.
City of Abbotsford	-	No permit required. ESC measures will be in place.	No permit required. ESC measures will be in place.	N/A	-	N/A	N/A

NOTES:

1. A bylaw is considered applicable if specific actions are required to comply with the bylaw (i.e., permit application or mitigation measures). Specific events where bylaws will apply are based on information available at the time of report completion and may change during detailed design.

N/A: this type of bylaw is not present in the municipality

“-“: The CTS TIMC Project is likely exempt from this bylaw or this bylaw does not apply to the CTS TIMC Project.

5.0 Potential Environmental Effects, Risks, and Proposed Mitigation Measures

The CTS TIMC Project may have adverse effects on environmental resources. Potential environmental effects were identified when an environmental resource that is likely present in one or more of the events (as identified in Section 3.0) may be adversely affected directly or indirectly by CTS TIMC Project activities (as detailed in Table 2) within the short-term (immediately after completion of CTS TIMC Project activities) or medium-term (within one year of the completion of CTS TIMC Project activities).
The qualitative assessment of residual risk (the potential effect of the CTS TIMC Project on the environmental resource) has been categorized as one of the following:

- Negligible: residual effects are not detectable.
- Low: residual effects are detectable, but well within the range of expected natural variation or below regulatory limits. environmental and/or regulatory limits.
- Moderate: residual effects are detectable and may approach upper regulatory limits or near the limits of expected natural variation.
- High: residual effects are beyond regulatory limits or beyond natural variation.

After implementation of the proposed mitigation measures (Table 23), the impact of the CTS TIMC Project on environmental and land use resources is anticipated to be low to moderate

Table 23: Project Potential Effects and Proposed Mitigation Measures

Environmental Resource	Potential Effects	Event/Facility	Proposed Mitigation Measures	Residual Risk
Agricultural land	Disturbance of the agricultural land capability of soils during ground disturbance	• LIV COQ 323 Event 9 • TIL BEN Event 3 • TIL BEN Event 5	• Separate and stockpile topsoil and subsoils • Maintain soil layers (two layers) to manage soil capability • Cover work areas with rigmats, where practicable, to protect the ground surface	Low
Plant species of conservation concern	Change in abundance of plant species	• TIL BEN Event 3 • TIL BEN Event 5	• Locate TWS and access outside wetland habitat to the extent practicable • Complete pre-construction plant survey during the growing season (spring or summer), if practicable, to search for species of concern in event • Salvage and relocate species of conservation concern if found during survey	Low Mitigation measures are expected to detect and relocate plant species of concern, where feasible.
Ecological communities of conservation concern	Change in condition or loss of ecological community of conservation concern	• TIL BEN Event 3	• Remove soil in layers to preserve organic soil layer • Restore site after pipeline repairs by maintaining the separation of the organic and mineral (sub-soil) layers • Allow for natural regeneration	Low Event overlaps a small portion of this ecological community.
Trees	Loss or decline in the health of trees due to interactions with roots during pipeline mitigation activities	• TIL BEN Event 3	• Use hydrovac or airvac where trees may be directly affected by the Project in consultation with a certified arborist • Relocate temporary workspaces away from the drip line of adjacent trees • Install tree protection fencing	Low Mitigation measures are expected to avoid or limit potential impacts to tree roots.
Noxious weeds	Spreading noxious weeds due to ground disturbing activities	• TIL BEN Event 3 • TIL FRA 508 Event 1 • CPH NOO 508 Events 4 & 5 • Port Mann Valve Station	• Prepare a Weed Management Plan for the CTS TIMC Project • Implement weed management prior to clearing activities pursuant to the BC *Weed Act* • Implement vehicle cleaning procedures to prevent the spread of weeds outside the events	Moderate Aggressive weeds may be difficult to control at some events.
Wildlife and Wildlife Habitat	Modification or destruction of wildlife habitat	• TIL BEN 323 Event 3 • TIL BEN 323 Event 5 • CPH NOO 508 Events 4 & 5	• Avoid ground disturbing work in wildlife habitat where practicable • Place TWS outside wildlife habitat • Restore workspace in wildlife habitat to facilitate the restoration of wildlife habitat (e.g., using soil handling methods in TIL BEN 323 Event 3 to facilitate regrowth of bog species)	Moderate Some wildlife habitat is likely to be modified in the short-term.
Bird nests	Incidental loss of active bird nests	• TIL BEN 323 Event 5 • CPH NOO Event 4 & 5 • CPH NOO Event 9 • CPH NOO Event 20 • LIV COQ Event 9 • Port Mann Valve Station • Noons Creek Valve Assembly • Huntingdon Control Station	• Undertake vegetation clearing outside the regional nesting period for breeding birds in the Lower Mainland (i.e., late March to mid-August [A1 zone, Government of Canada 2018]) if practicable • If vegetation clearing will overlap with the nesting period, engage a qualified biologist to determine if a pre-construction survey for nests is required for facilities and events with adjacent potential nesting habitat. • Complete pre-construction nest survey if required • Implement set-backs from nests found in events or re-schedule work outside the nesting period • Engage a qualified professional to check buildings that are near Project activities or will be affected by Project activities (i.e., Huntingdon Control Station) for nesting birds and roosting bats	Low Pre-nest surveys or work outside the nesting period is likely to avoid most incidental loss of active nests.
Wildlife	Incidental loss of individual animals (small mammals, reptiles, and/or amphibians)	• TIL BEN 323 Event 3 • TIL BEN 323 Event 5 • CPH NOO 508 Events 4 & 5	• Locate TWSs away from wetlands, ditches, and other amphibian habitats • Develop a project-specific wildlife discovery contingency plan • Complete pre-construction survey for Olympic shrew at TIL BEN 323 Event 3 and determine the requirement for pre-construction salvage and exclusion fencing • Complete pre-construction survey for western painted turtles at CPH NOO 508 Events 4 & 5 to evaluate potential impacts of open cut areas on this species • If project activities overlap with amphibian breeding or post-breeding dispersal, undertake a pre-construction amphibian survey to determine whether amphibians are present and salvage or other mitigation measures are required.	Moderate

Table 23: Project Potential Effects and Proposed Mitigation Measures

Environmental Resource	Potential Effects	Event/Facility	Proposed Mitigation Measures	Residual Risk
Fish and Fish Habitat	Modification to or destruction of fish habitat Disturbance to or death of fish	• TIL BEN 323 Event 5	• Complete daily environmental monitoring during instream works • Avoid working in watercourses and ditches where possible • Reduce disturbance to riparian vegetation • Fence TWSs to reduce the risk of encroachment in riparian areas • Complete instream works during the applicable reduced risk instream works window for the Lower Mainland Region • Isolate and salvage instream work areas prior to dewatering and maintain base flows in watercourses • Reduce the duration of instream work • Develop a spill response plan and hazardous materials management plan prior to construction • Restore the stream bed and banks after instream works are complete	Moderate
Water Quality	Impacts to surface water quality due to introduction of deleterious substances e.g., sediment, material from spills	• TIL BEN 323 Event 3 • TIL BEN 323 Event 5 • CPH NOO 508 Event 4 & 5 • CPH NOO 508 Event 20 • Roebuck Valve Station • Port Mann Valve Station • Nichol Valve Assembly • Livingston Regulating Station	• Complete environmental monitoring during construction, including in-situ water quality monitoring • Install ESC measures to prevent deleterious substances from entering watercourses or the storm system • Fence TWSs to reduce the risk of encroachment in riparian areas • Work strategically during significant rainfall events, reducing sediment-generating activities • Work in isolation of flowing water • Develop a Spill Response Plan and Hazardous Materials Management Plan prior to construction • Restore areas after construction is complete to mitigate potential erosion	Low

5.1 Contaminated Sites

Based on available information and field surveys, fill soils of unknown quality may be encountered during pipeline mitigation works at all proposed events. As soil will be removed and disposed of via hydrovac, and at the time of writing this EOA adequate historical analytical data for soils are unavailable, soil characterization testing will be required. Soil characterization sampling should include, at minimum: LEPH/HEPH, PAH, BTEX/VPH, and metals. Table 11 includes additional soil characterization requirements for individual events. Depending on the selected disposal site location, the disposal site facility or receiving site may require additional soil quality characterization prior to accepting the soil.

- If visual or olfactory indications of contamination (e.g., staining, debris) are found during mitigation works, work should halt, and contaminated soil should be characterized prior to hydrovac activities continuing in the area.
- If excavation dewatering is required during mitigation works, refer to Table 11 for sampling requirements related to individual events/facilities.

6.0 Summary

The EOA determined that a range of environmental and land use resources and constraints are present at events and facilities in the FEI CTS TIMC Project (Table 24). Environmental and land use constraints are present at nine of the 13 events and seven of the 13 facilities. Regulatory requirements under the federal *Fisheries Act* are expected to be required for one event. Provincial permits under the *Agricultural Land Commission Act*, *Wildlife Act*, and *Water Sustainability Act* are anticipated to be required for five events and two facilities. Permits under municipal bylaws are anticipated to be required for two events and seven facilities.

Table 24: Summary of Environmental and Land Use Constraints and Regulatory Requirements Anticipated for the CTS TIMC Project

Pipeline or Facility	Event	Land Use and Environmental Constraints					Regulatory Requirement					
		Land Use (e.g., ALR Land)	Vegetation	Wildlife	Fish and Fish Habitat	Contaminated Sites	ALC Soil Deposit Permit	General Wildlife Permit	*Water Sustainability Act* Section 11 Permit	*Fisheries Act* Request for Review	Provincial Fish Collection Permits	Municipal Permits
TIL BEN 323	3	X	X	X	X		X	X	X			
	5	X	X	X	X		X	X	X	X		
TIL FRA 508	1		X			X						X
	6											
LIV COQ 323	9	X	X	X			X					X
HUN NIC 762	36											
	41			X								
CPH NOO 508	1											
	4 & 5		X	X	X			X	X			
	9			X								
	14											
	20			X	X							
HUN ROE 1067	12	X					X					

Table 24: Summary of Environmental and Land Use Constraints and Regulatory Requirements Anticipated for the CTS TIMC Project

Pipeline or Facility	Event	Land Use and Environmental Constraints					Regulatory Requirement					
		Land Use (e.g., ALR Land)	Vegetation	Wildlife	Fish and Fish Habitat	Contaminated Sites	ALC Soil Deposit Permit	General Wildlife Permit	*Water Sustainability Act* Section 11 Permit	*Fisheries Act* Request for Review	Provincial Fish Collection Permits	Municipal Permits
Huntingdon Control Station				X			X					
Livingstone Regulating Station					X							X
Coquitlam Regulating Station (CPH NOO Event 14)												
Nichol Valve Station					X							X
Roebuck Valve Station					X							X
Fraser Gate Station												
Tilbury Regulating Station (TIL FRA Event 1)			X			X						X
Port Mann Valve Station			X	X	X							X
Benson Regulating Station							X					X

Table 24: Summary of Environmental and Land Use Constraints and Regulatory Requirements Anticipated for the CTS TIMC Project

Pipeline or Facility	Event	Land Use and Environmental Constraints					Regulatory Requirement					
		Land Use (e.g., ALR Land)	Vegetation	Wildlife	Fish and Fish Habitat	Contaminated Sites	ALC Soil Deposit Permit	General Wildlife Permit	*Water Sustainability Act* Section 11 Permit	*Fisheries Act* Request for Review	Provincial Fish Collection Permits	Municipal Permits
Cape Horn Regulating Station (CPH NOO Event 1)												
Tilbury LNG Plant												X
Noons Creek Valve Assembly				X								
Anmore Regulating Station												

7.0 References

BC Conservation Data Centre. 2015. Conservation Status Report: *Sorex rohweri*. B.C. Ministry. of Environment. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Sept. 19, 2020).

BC Conservation Data Centre. 2020. Species Summary: *Myodes gapperi occidentalis*. B.C. Ministry of Environment. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed Sept. 19, 2020).

BC Data Catalog. 2020a. Accessed from: https://catalogue.data.gov.bc.ca/dataset?download_audience=Public. September 2020.

BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD). 2016. Biogeoclimatic Ecosystem Classification Subzone/Variant Map for the Chilliwack Resource District, South Coast Region. Accessed from: https://www.for.gov.bc.ca/hre/becweb/resources/maps/FieldMaps.html. September 2020.

BC MOECCS. 2019. *Environmental Management Act* – Contaminated Sites Regulations. Accessed from https://www.bclaws.ca/civix/document/id/lc/statreg/375_96_00. October 2020.

BC MOECCS. 2020b. HabitatWizard. Accessed from: http://www.env.gov.bc.ca/habwiz/. September 2020.

British Columbia Ministry of Environment and Climate Change Strategy (BC MOECCS). 2020a. Fish Inventories Data Queries. Accessed from: http://a100.gov.bc.ca/pub/fidq/viewWatershedDictionary.do . September 2020.

British Columbia Ministry of Environment. 2006. Guidelines for Reduced Risk Instream Work Windows Ministry of Environment, Lower Mainland Region. Accessed from: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/working-around-water/work_windows_low_main.pdf. Accessed September 2020.

City of Abbotsford. 2020. City of Abbotsford WebMap. Accessed from: https://maps.abbotsford.ca/Html5Viewer/. September 2020.

City of Coquitlam. 2020. QtheMap. Accessed from: https://coquitlam.maps.arcgis.com/apps/webappviewer/index.html?id=2d58aee859754918ae54d30da4bbba49. September 2020.

City of Delta. 2020. DeltaMap. Accessed from: http://deltamap.delta.ca/. September 2020.

City of Port Moody. 2020. ViewPort. Accessed from: https://view.portmoody.ca/index.php. September 2020.

City of Richmond. 2018. Richmond Interactive Map V.1.17.2. https://maps.richmond.ca/rim/. September 2020.

City of Richmond. 2019. City of Richmond 2041 OCP Land Use Map. Accessed from: https://www.richmond.ca/__shared/assets/2041_OCP_Land_Use_Map10716.pdf. Accessed: September 2020.

City of Surrey. 2020. City of Surrey Mapping Online System. Accessed from: https://cosmos.surrey.ca/external/. September 2020.

City of Vancouver. 2020a. Open Data Portal. Accessed from: https://opendata.vancouver.ca/map/+2d9b511284314bd6/edit/. Accessed October 2020.

City of Vancouver. 2020b. VanMap. Accessed from: https://vanmapp.vancouver.ca/pubvanmap_net/default.aspx. Accessed September 2020.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2003. COSEWIC assessment and update status report on Townsend's *mole Scapanus townsendi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 24 pp

DataBC. 2020. iMap. Accessed from: https://maps.gov.bc.ca/ess/hm/imap4m/. Accessed: September 2020.

Environment and Climate Change Canada. 2018. Recovery Strategy for the Western Painted Turtle (*Chrysemys picta bellii*) Pacific Coast population in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 2 parts: 31 pp. + 59 pp.

Environmental Risk Information Services. 2020. Database Report – CTS TIMC Vancouver BC. June 12, 2020.

Government of Canada. 2018. Nesting Zones. Accessed from: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#toc0. September 2020.

Government of Canada. 2020. A Guide to Your Responsibilities under the *Species at Risk Act*. Accessed from: https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/your-responsibility/your-responsability-guide.html. Accessed: September 2020.

Klinkenberg, B. (ed.) 2019. E-Fauna BC: Electronic Atlas of the Fauna of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Efauna.bc.ca. Accessed: September 2020.

Ministry of Agricultural and Ministry of Environment & Climate Change. 2018. British Columbia Soil Information Finder Tool. Province of British Columbia. Accessed from: https://www.arcgis.com/apps/MapSeries/index.html?appid=cc25e43525c5471ca7b13d639bbcd7aa. September 2020.

Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2020. Invasive Alient Plant Program Map Display (Version 2.0.0). Accessed from: https://maps.gov.bc.ca/ess/hm/iapp/. Accessed: September 2020.

Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2016. Biogeoclimatic Ecosystem Classification Subzone/Variant Map for the Chilliwack Resource District. South Coast Region. Accessed from: https://www.for.gov.bc.ca/hre/becweb/resources/maps/FieldMaps.html. September 2020.

Province of British Columbia. 2020a. Data Catalogue. Accessed from: https://catalogue.data.gov.bc.ca/dataset?download_audience=Public. Accessed: August, September 2020.

Province of British Columbia. 2020b. Single Waterbody Query. Accessed from: http://a100.gov.bc.ca/pub/fidq/viewSingleWaterbody.do. Accessed: September 2020.

Provincial Agricultural Land Commission. 2014. *ALC Act* & ALR Regulation. Accessed from: https://www.alc.gov.bc.ca/alc/content/alc-act-alr-regulation. Accessed: September 2020.

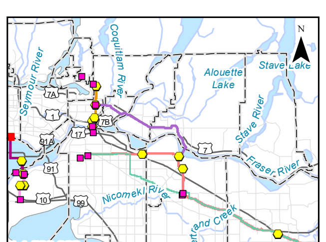
South Coast Conservation Program. 2020. Great Blue Heron fannini ssp. http://www.sccp.ca/species-habitat/great-blue-heron-fannini-ssp. Accessed: September 2020.

Township of Langley. 2020. GeoSource Interactive Web Map. Accessed from: https://mapsvr.tol.ca/geosource3/. September 2020.

Village of Anmore. 2014 Official Community Plan. Available from: https://anmore.com/wp-content/uploads/2017/06/Official-Community-Plan.pdf. Accessed: October 2020.

Wildlife Tree Stewardship Program (2020). Nest Tree Report. The Community Mapping Network. Available from: http://www.cmnmaps.ca/wits/ Accessed: September 2020.

Appendix A Maps



Local Street
Railway
Transmission Line
Water Main
Waterbody
Municipal Boundary
Facility
TIL FRA 508
Species at Risk (CDC)

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

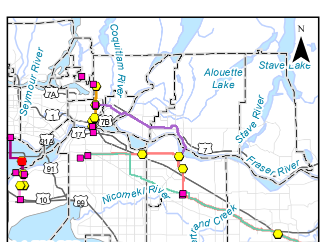
Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 1 of 23

Title
Project Locations
Fraser Gate Station TIL FRA 508



Local Street
Transmission Line
Municipal Boundary
TIMC Event
TIMC Feature
TIMC Event Line
TIL FRA 508

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec | FORTIS BC

Project Location
Lower Mainland, BC

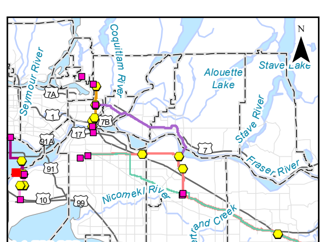
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 2 of 23

Title
Project Locations
Event 6 TIL FRA 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship



Local Street
Water Main
Waterbody
Municipal Boundary
Facility
Species at Risk (CDC)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Stantec | FORTIS BC

Project Location
Lower Mainland, BC

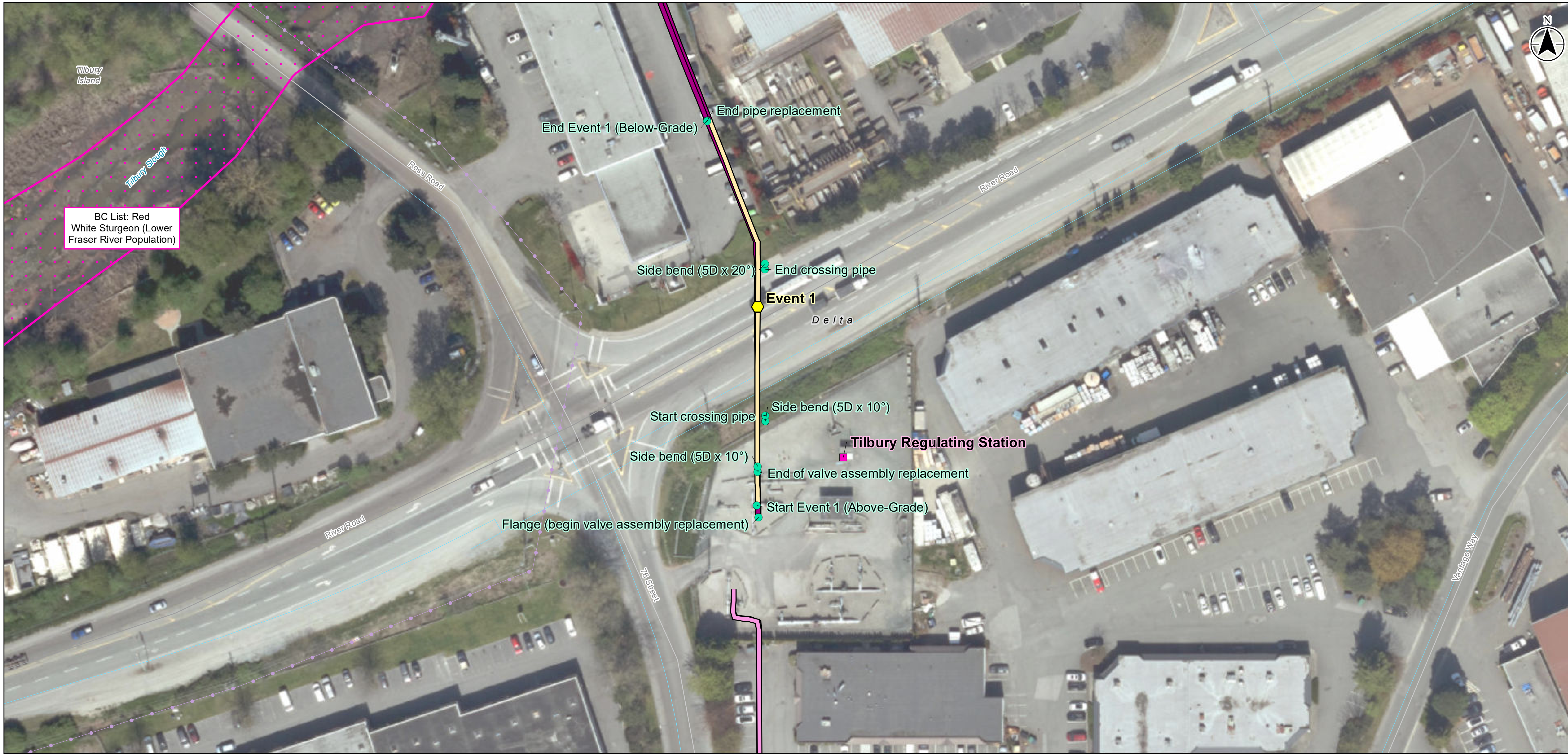
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

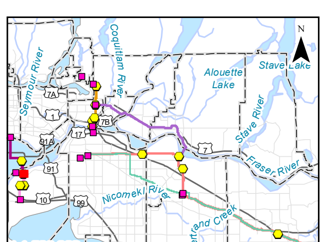
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 3 of 23

Title
Project Locations
Tilbury LNG Plant

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship





Road
Local Street
Transmission Line
Water Main
Waterbody
Municipal Boundary
Facility
TIMC Event
TIMC Feature
TIMC Event Line
TIL BEN 323
TIL FRA 508
Species at Risk (CDC)

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

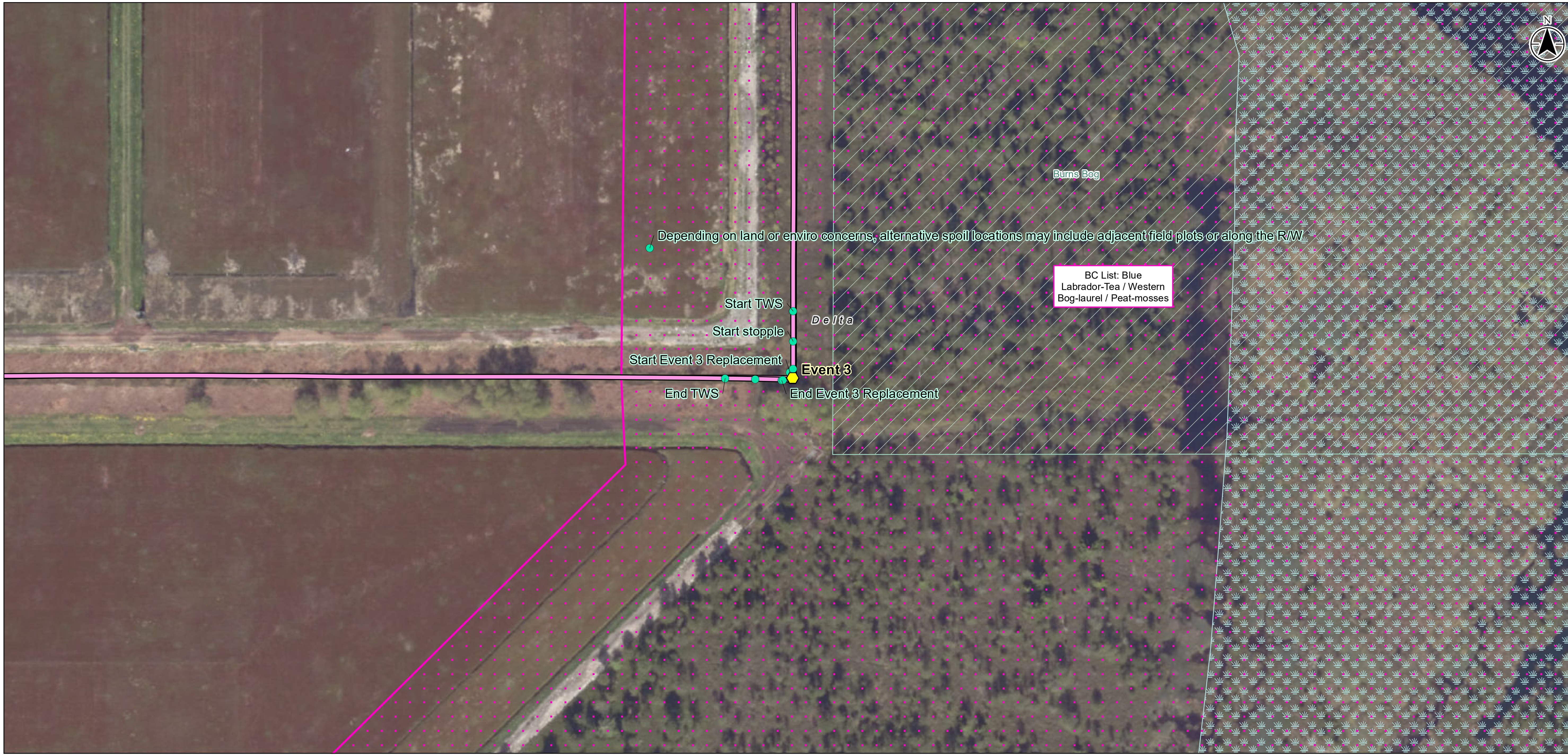
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

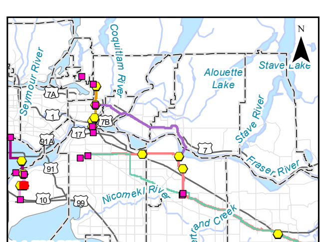
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 4 of 23

Title
Project Locations
Event 1 & Tilbury Regulating Station TIL FRA 508 & TIL BEN 323

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





Wetland
Local Greenspace
Municipal Boundary
TIMC Event
TIMC Feature
TIL BEN 323
Species at Risk (CDC)

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

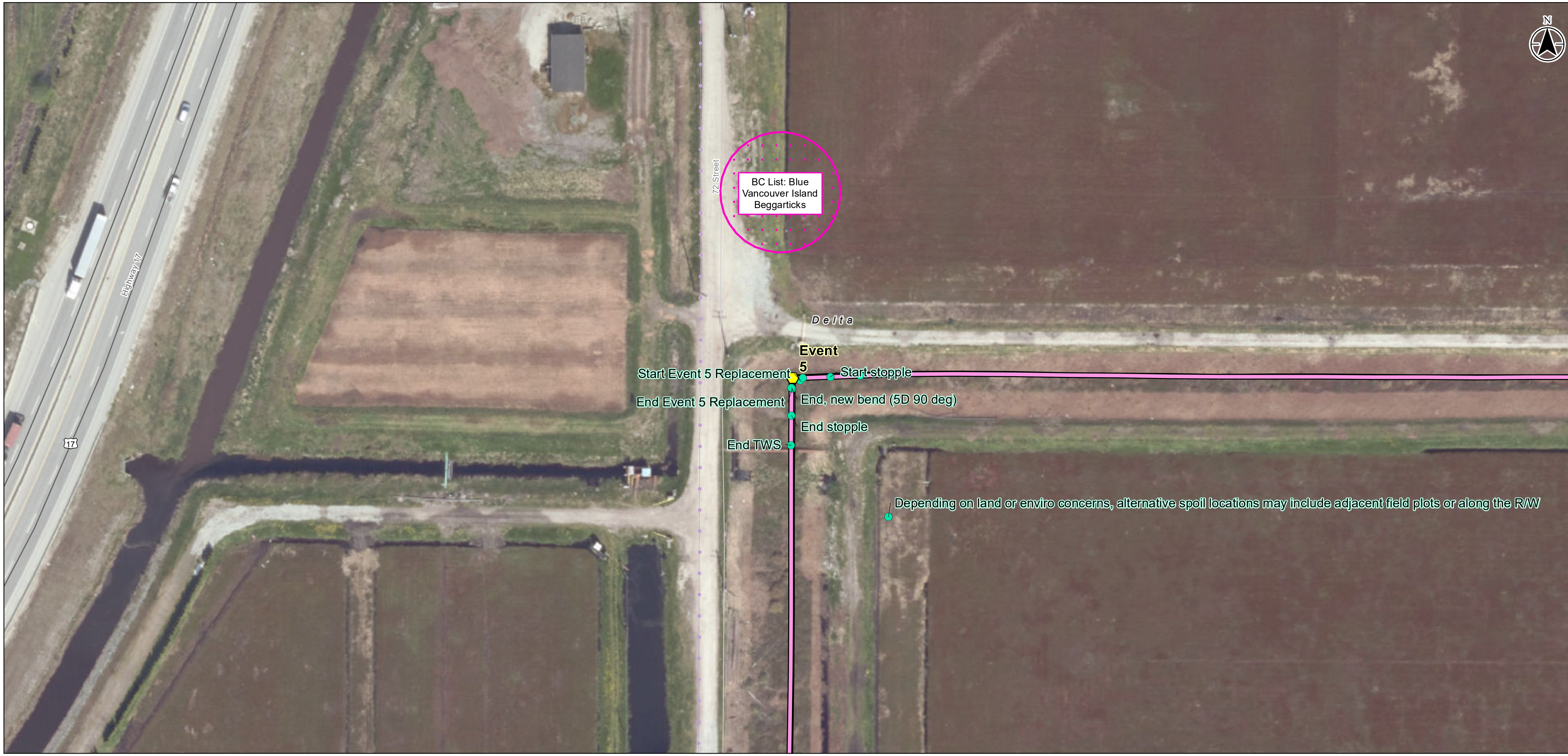
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

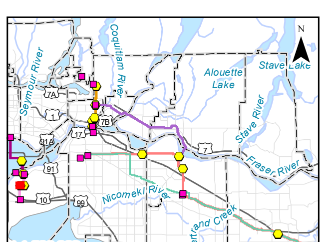
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 5 of 23

Title
Project Locations
Event 3 TIL BEN 323

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship





- Highway
- Local Street
- Transmission Line
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIL BEN 323
- Species at Risk (CDC)

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

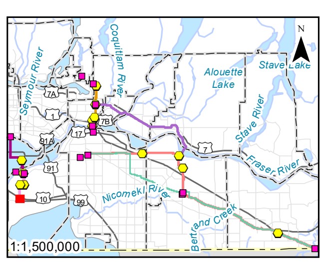
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 6 of 23

Title
Project Locations
Event 5 TIL BEN 323

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship



Highway
Road
Local Street
Transmission Line
Water Main
Municipal Boundary
Facility
TIL BEN 323

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

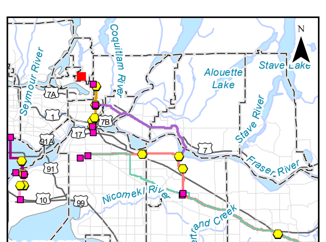
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
2

Page No.
7 of 23

Title
Project Locations
Benson Regulating Station TIL BEN 323

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship



Road
Local Street
Municipal Boundary
Facility

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

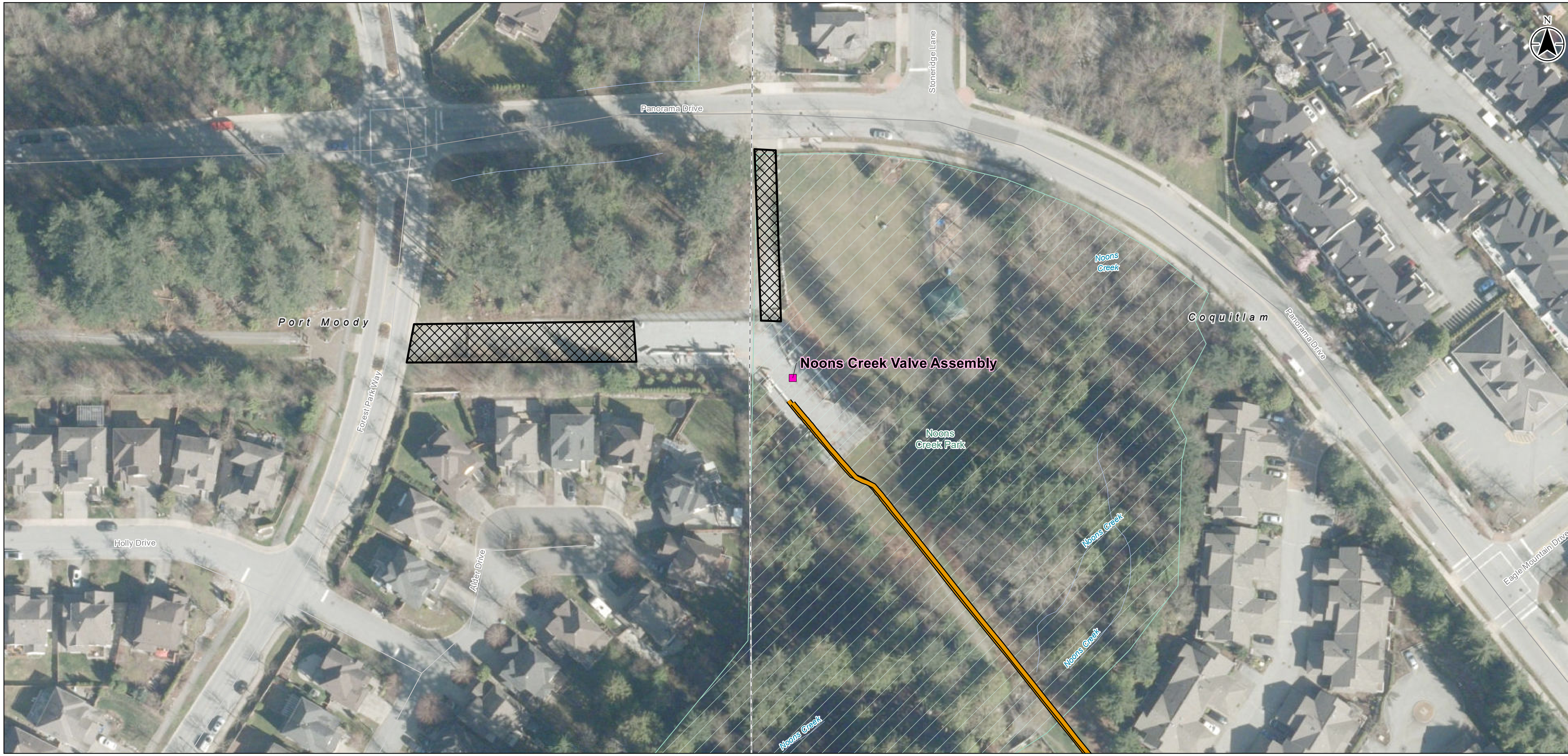
Project Location
Lower Mainland, BC

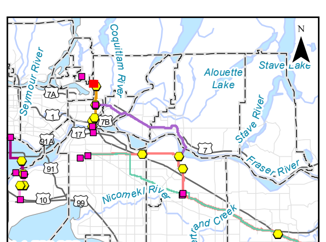
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 8 of 23

Title
Project Locations
Anmore Regulating Station CPH BUR 508





- Road
- Local Street
- Watercourse
- Local Greenspace
- Municipal Boundary
- Facility
- Temporary Workspace
- CPH NOO & NC 508

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

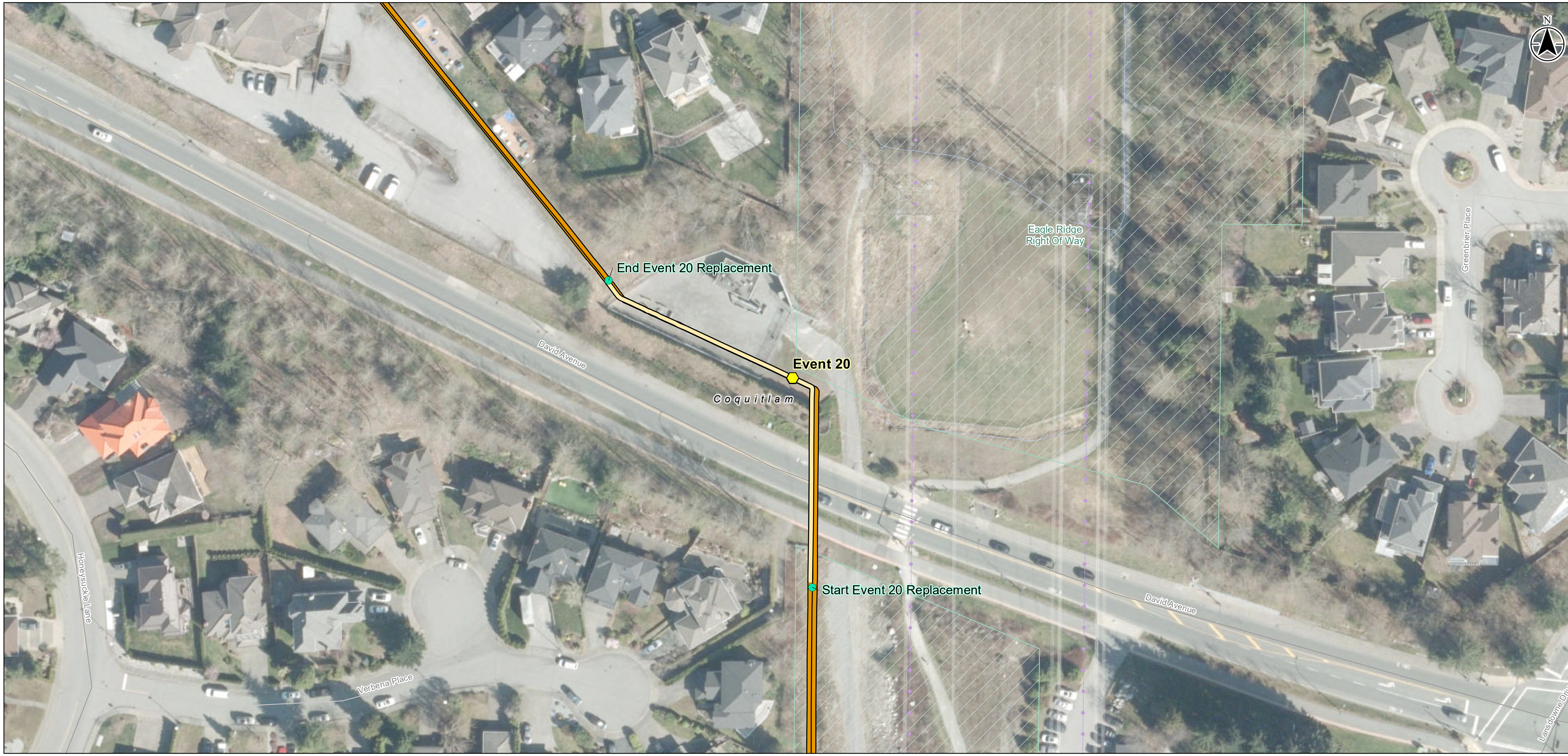
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

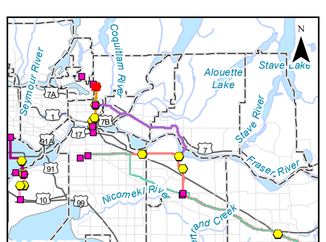
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 9 of 23

Title
Project Locations
Noons Creek Valve Assembly CPH NOO & NC 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





- Road
- Local Street
- Transmission Line
- Watercourse
- Local Greenspace
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIMC Event Line
- CPH NOO & NC 508

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

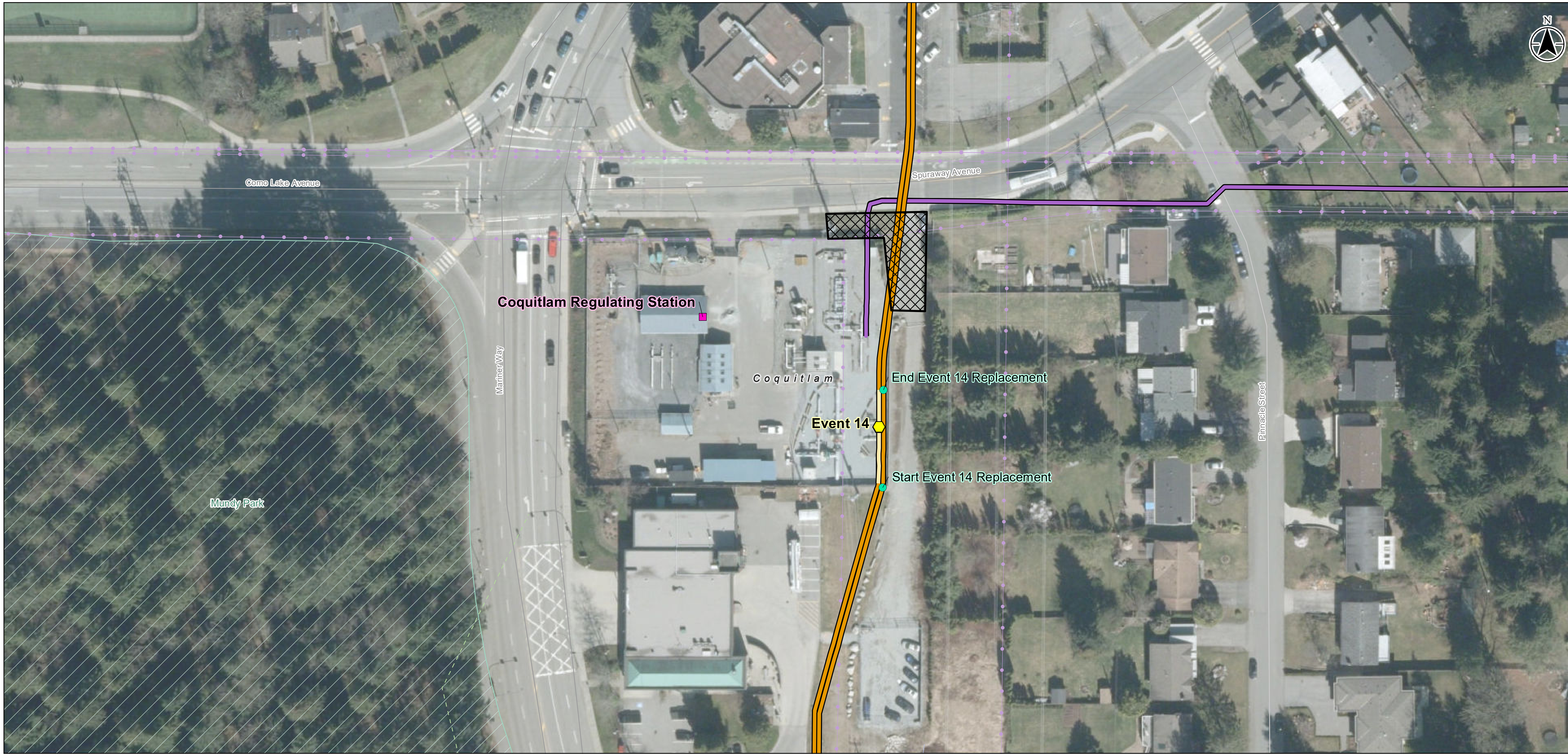
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

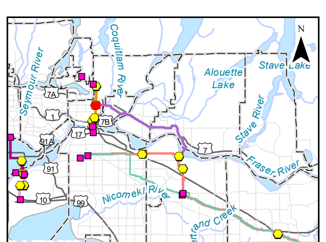
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 10 of 23

Title
Project Locations
Event 20 CPH NOO & NC 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





- Road
- Local Street
- Trail
- Transmission Line
- Watercourse
- Local Greenspace
- Municipal Boundary
- Facility
- Temporary Workspace
- TIMC Event
- TIMC Feature
- TIMC Event Line
- CPH NOO & NC 508
- LIV COQ 323, BH MFL

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

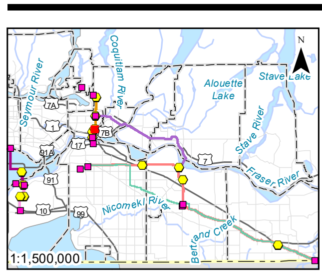
Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. **11 of 23**

Title
Project Locations
Event 14 & Coquitlam Regulating Station
CPH NOO & NC 508



- Highway
- Road
- Local Street
- Transmission Line
- Watercourse
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIMC Event Line
- CPH NOO & NC 508

Critical Habitat

- Western Painted Turtle Pacific Coast population

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

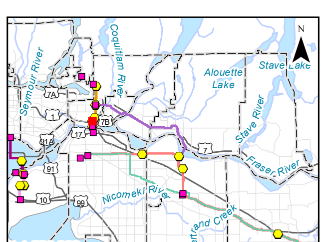
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
2

Page No.
12 of 23

Title
Project Locations
Event 9 CPH NOO & NC 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship



Highway
Road
Local Street
Railway
Transmission Line
Watercourse
Municipal Boundary

TIMC Event
TIMC Feature
TIMC Event Line
CPH NOO & NC 508

Critical Habitat
Western Painted Turtle
Pacific Coast population

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

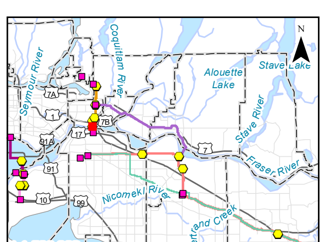
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 13 of 23

Title
Project Locations
Event 4 and 5 CPH NOO & NC 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship



Local Street
Transmission Line
Municipal Boundary
Facility
Temporary Workspace
TIMC Event
TIMC Feature
TIMC Event Line
CPH NOO & NC 508

Critical Habitat

Western Painted Turtle Pacific Coast population

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

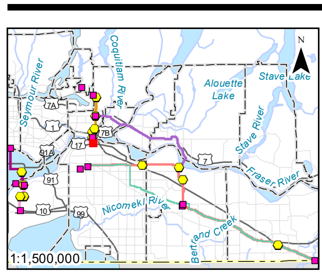
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
2

Page No.
14 of 23

Title
Project Locations
Cape Horn Regulating Station CPH NOO & NC 508

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellliship



Highway
Road
Local Street
Railway
Transmission Line
Municipal Boundary
Facility
Temporary Workspace

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

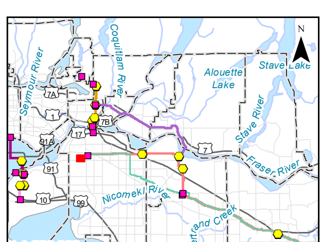
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
2

Page No.
15 of 23

Title
Project Locations
Port Mann Valve Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship



- Road
- Local Street
- Transmission Line
- Watercourse
- Municipal Boundary
- Facility
- HUN ROE 1067

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

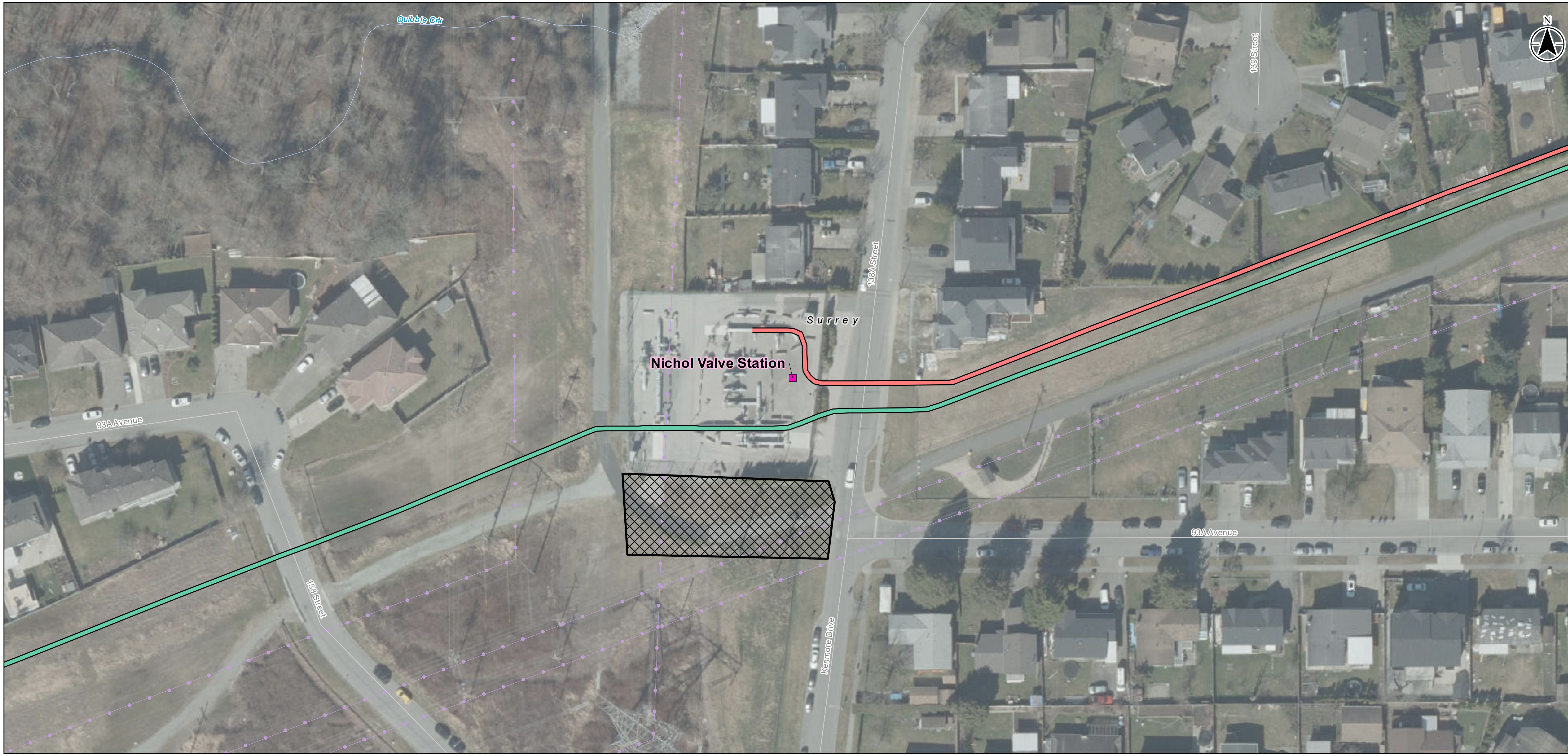
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

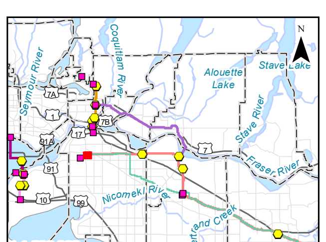
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 16 of 23

Title
Project Locations
Roebuck Valve Station LIV PAT 457

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship





- Local Street
- Transmission Line
- Watercourse
- Municipal Boundary
- Facility
- Temporary Workspace
- HUN ROE 1067
- HUN NIC 762

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

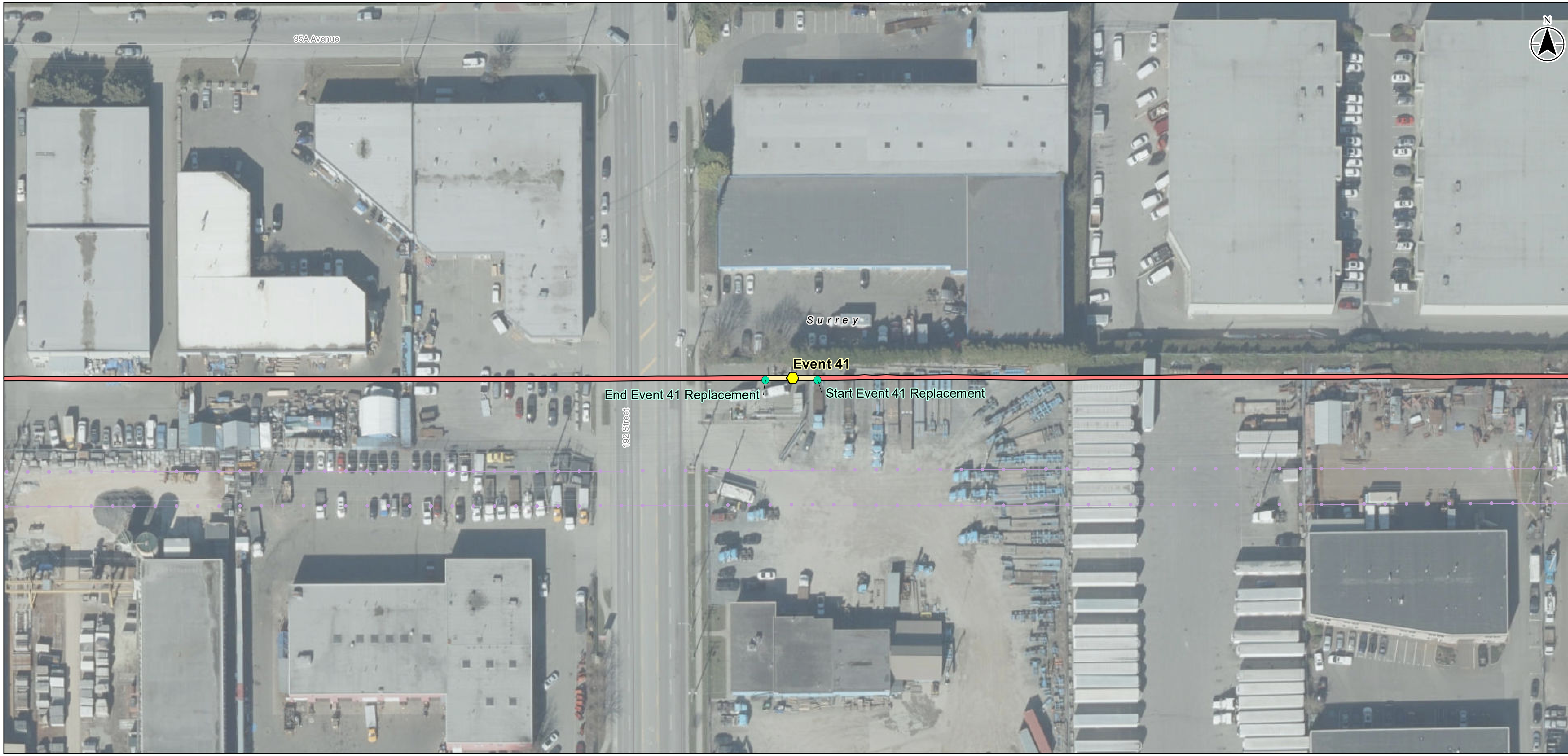
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

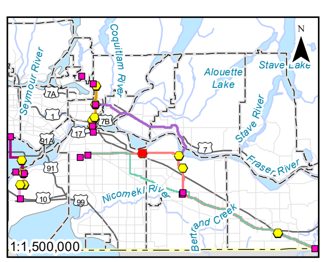
Figure No. 2

Page No. 17 of 23

Title
Project Locations
Nichol Valve Station HUN NIC 762

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship





- Road
- Local Street
- Transmission Line
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIMC Event Line
- HUN NIC 762

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

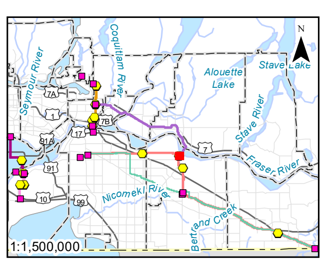
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No.
2

Page No.
18 of 23

Title
Project Locations
Event 41 HUN NIC 762

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship



- Road
- Local Street
- Transmission Line
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIMC Event Line
- HUN NIC 762
- LIV COQ 323, BH MFL
- Species at Risk (CDC)

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

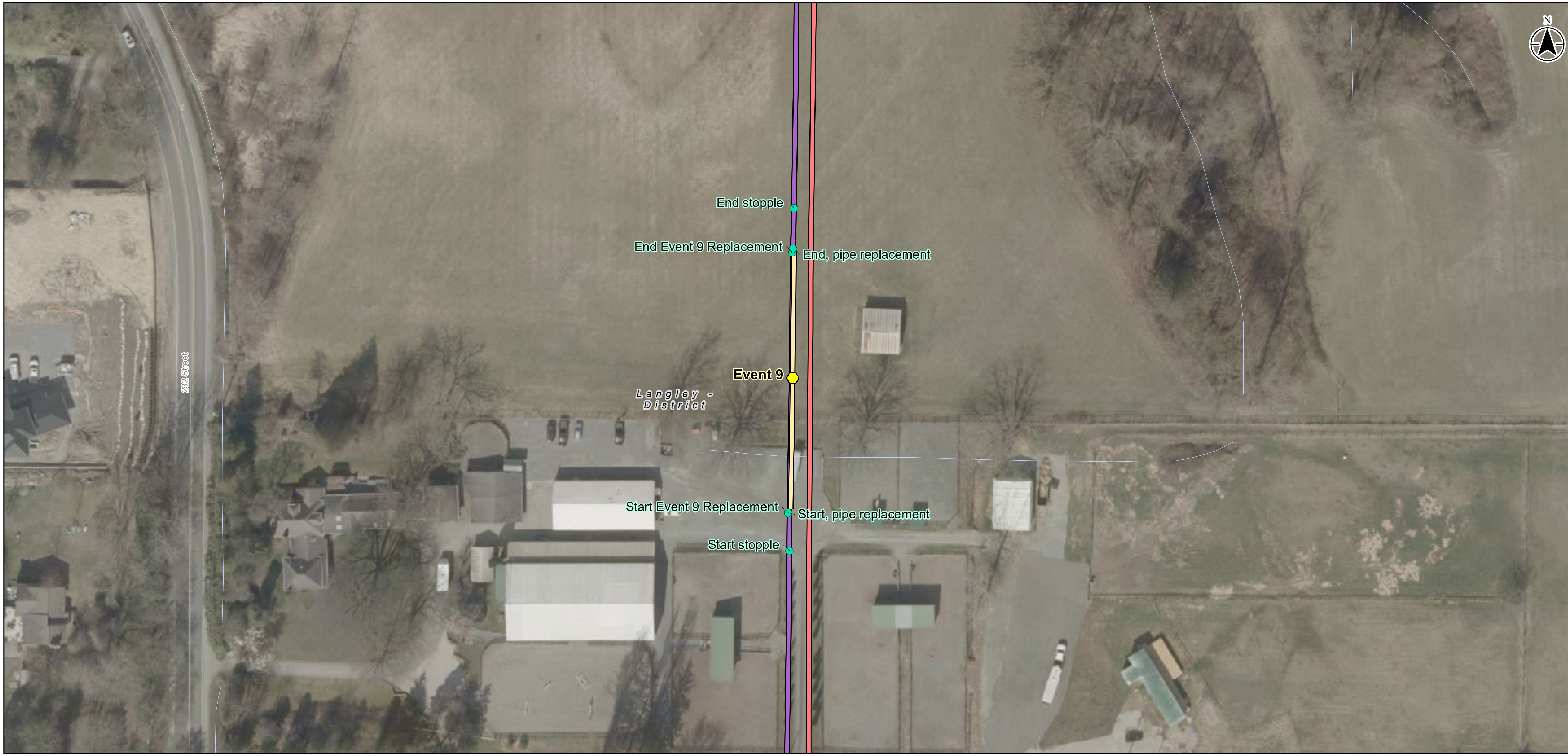
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

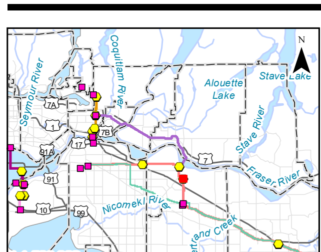
Figure No.
2

Page No.
19 of 23

Title
Project Locations
Event 36 HUN NIC 762

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





- Road
- Watercourse
- Municipal Boundary
- TIMC Event
- TIMC Feature
- TIMC Event Line
- HUN NIC 762
- LIV COQ 323, BH MFL

0 10 20 30 40 50 m

1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

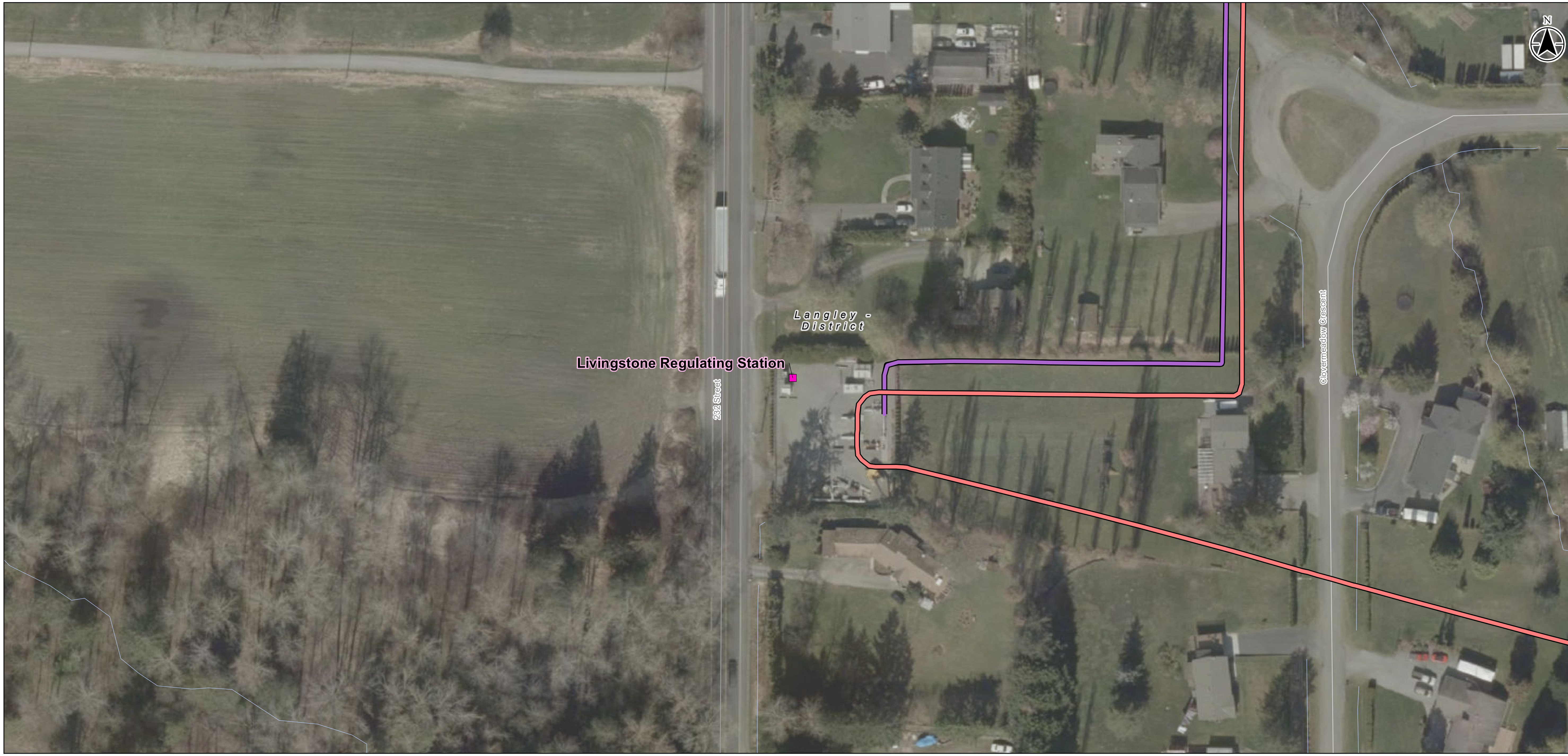
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

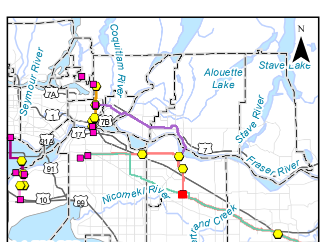
Figure No.
2

Page No.
20 of 23

Title
Project Locations
Event 9 HUN NIC 762

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmellship





- Road
- Local Street
- Watercourse
- Municipal Boundary
- Facility
- HUN NIC 762
- LIV COQ 323, BH MFL

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

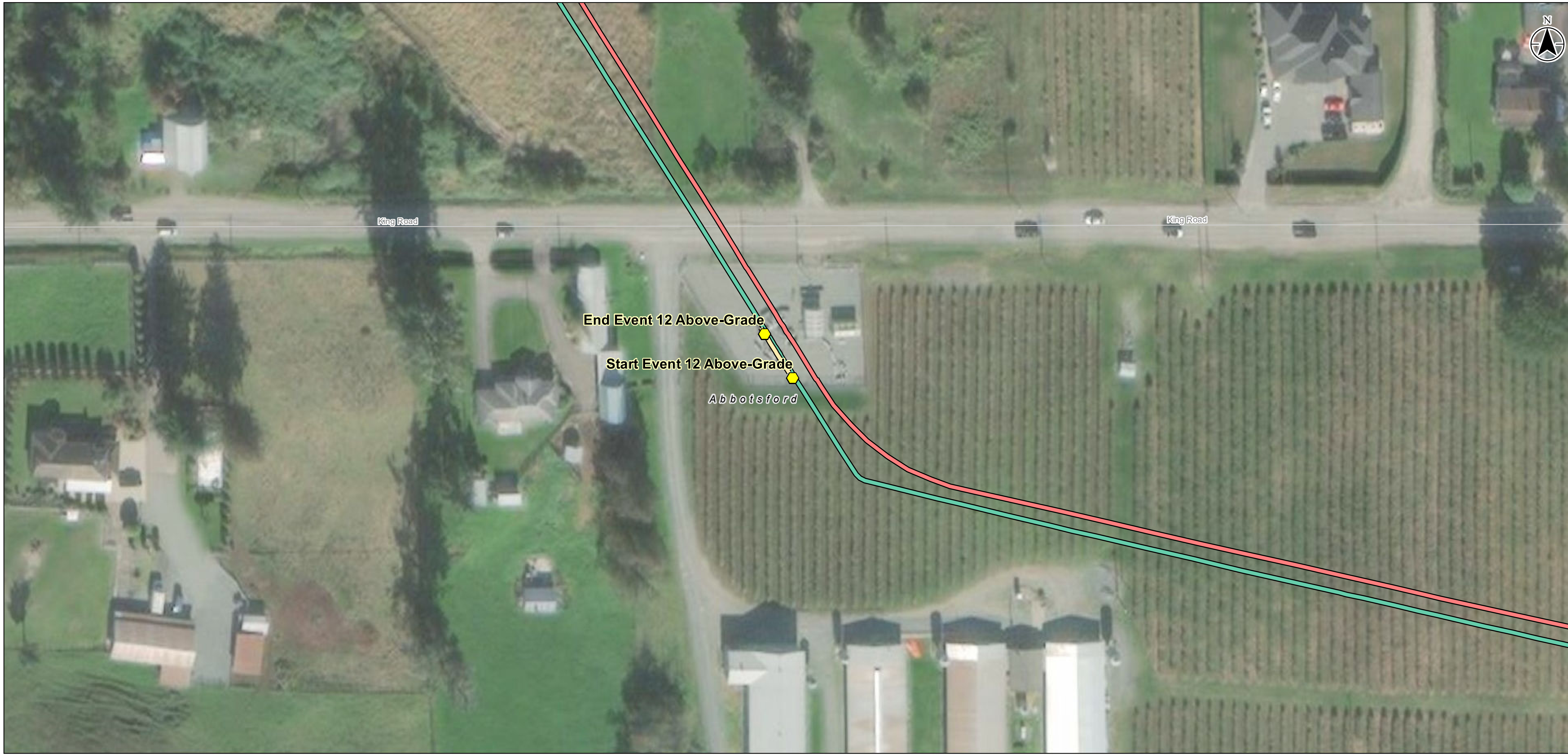
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

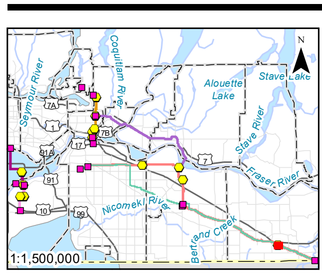
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 21 of 23

Title
Project Locations
Livingstone Regulating Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





Local Street
Municipal Boundary
TIMC Event
TIMC2 Event Line
HUN ROE 1067
HUN NIC 762

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

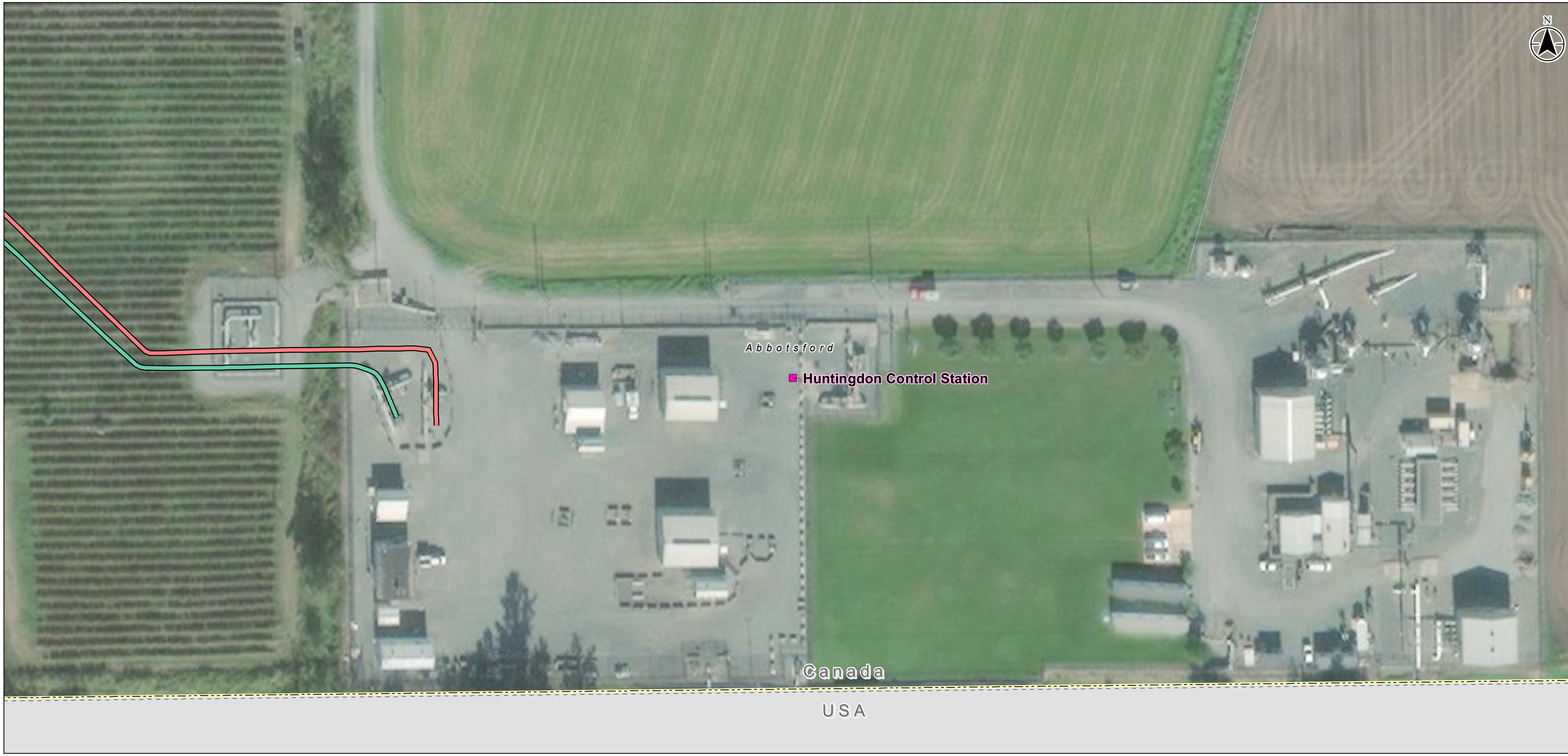
Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

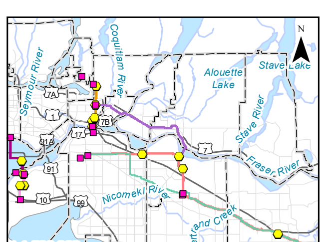
Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 22 of 23

Title
Project Locations
Event 12 HUN ROE 1067

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship





Watercourse
Municipal Boundary
Facility
HUN ROE 1067
HUN NIC 762

0 10 20 30 40 50 m
1:1,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada; City of Abbotsford; City of Coquitlam; City of Delta; City of Surrey; Township of Langley.
3. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Environmental Overview Assessment

Figure No. 2
Page No. 23 of 23

Title
Project Locations
Huntingdon Control Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_EAO\fig_110904209_002_project_locations.mxd Revised: 2020-11-02 By: cmelliship

Appendix B Photos


Photo 1 TIL BEN 323 Event 3 – Overview of Event Location

Photo 2: TIL BEN 323 Event 5 – Ditch Along Northern Portion of the Event


Photo 3 TIL BEN 323 Event 5 – Overview of Ditch

Photo 4 TIL BEN 323 Event 5 – Ditch Along Northern Portion of the Event

Photo 5 LIV COQ 323 Event 9 – Oak Tree East of the Pipeline ROW

Photo 6 CPH NOO 508 Event 4 and 5 – North of Lougheed Highway, Potential Wetland Area

Appendix C Conservation Data Centre Results

Scientific Name	English Name	Name Category	Prov Status	BC List	COSEWIC	SARA Schedule	SARA Status
Abies amabilis - Picea sitchensis / Oplopanax horridus	amabilis fir - Sitka spruce / devil's club	Ecological Community	S3	Blue			
Abies amabilis - Thuja plicata / Rubus spectabilis Very Wet Maritime	amabilis fir - western redcedar / salmonberry Very Wet Maritime	Ecological Community	S3	Blue			
Abies grandis / Berberis nervosa	grand fir / dull Oregon-grape	Ecological Community	S1	Red			
Abies grandis / Tiarella trifoliata	grand fir / three-leaved foamflower	Ecological Community	S1	Red			
Alnus rubra / Carex obnupta [Populus trichocarpa]	red alder / slough sedge [black cottonwood	Ecological Community	S1	Red			
Alnus rubra / Lysichiton americanus	red alder / skunk cabbage	Ecological Community	S2	Red			
Alnus rubra / Rubus spectabilis / Equisetum arvense	red alder / salmonberry / common horsetail	Ecological Community	S3	Blue			
Arbutus menziesii / Arctostaphylos columbiana	arbutus / hairy manzanita	Ecological Community	S2	Red			
Artemisia campestris - Festuca rubra / Racomitrium canescens	northern wormwood - red fescue / grey rock-	Ecological Community	S1	Red			
Bolboschoenus maritimus var. paludosus Alkali Marsh	seacoast bulrush Alkali Marsh	Ecological Community	S1	Red			
Carex lasiocarpa - Rhynchospora alba	slender sedge - white beak-rush	Ecological Community	S2	Red			
Carex lyngbyei Herbaceous Vegetation	Lyngbye's sedge herbaceous vegetation	Ecological Community	S2	Red			
Carex macrocephala Herbaceous Vegetation	large-headed sedge Herbaceous Vegetation	Ecological Community	S1S2	Red			
Carex sitchensis - Oenanthe sarmentosa	Sitka sedge - Pacific water-parsley	Ecological Community	S3	Blue			
Carex sitchensis / Sphagnum spp.	Sitka sedge / peat-mosses	Ecological Community	S2	Red			
Deschampsia cespitosa - Sidalcea hendersonii	tufted hairgrass - Henderson's checker-	Ecological Community	S1S2	Red			
Deschampsia cespitosa ssp. beringensis - Hordeum brachyantherum	tufted hairgrass - meadow barley	Ecological Community	S2	Red			
Distichlis spicata - Sarcocornia pacifica	seashore saltgrass - Pacific swampfire	Ecological Community	S1S2	Red			
Dulichium arundinaceum Herbaceous Vegetation	three-way sedge	Ecological Community	S2	Red			
Eleocharis palustris Herbaceous Vegetation	common spike-rush Herbaceous Vegetation	Ecological Community	S3	Blue			
Festuca roemeri - Koeleria macrantha	Roemer's fescue - junegrass	Ecological Community	S1	Red			
Juncus arcticus - Plantago macrocarpa	arctic rush - Alaska plantain	Ecological Community	S1	Red			
Leymus mollis ssp. mollis - Lathyrus japonicus	dune wildrye - beach pea	Ecological Community	S1S2	Red			
Menyanthes trifoliata - Carex lasiocarpa	buckbean - slender sedge	Ecological Community	S3	Blue			
Myosurus minimus - Montia spp. - Limnanthes macounii	tiny mousetail - montias - Macoun's meadow-	Ecological Community	S1	Red			
Myrica gale / Carex sitchensis	sweet gale / Sitka sedge	Ecological Community	S2	Red			
Picea sitchensis / Rubus spectabilis Dry	Sitka spruce / salmonberry Dry	Ecological Community	S1S2	Red			
Picea sitchensis / Rubus spectabilis Very Dry Maritime	Sitka spruce / salmonberry Very Dry	Ecological Community	S2	Red			
Picea sitchensis / Rubus spectabilis Very Wet Maritime	Sitka spruce / salmonberry Very Wet	Ecological Community	S2	Red			
Pinus contorta / Sphagnum spp. CDFmm	lodgepole pine / peat-mosses CDFmm	Ecological Community	S1	Red			
Pinus contorta / Sphagnum spp. Very Dry Maritime	lodgepole pine / peat-mosses Very Dry	Ecological Community	S3	Blue			
Populus tremuloides / Malus fusca / Carex obnupta	trembling aspen / Pacific crab apple / slough	Ecological Community	S1	Red			
Populus trichocarpa - Alnus rubra / Rubus spectabilis	black cottonwood - red alder / salmonberry	Ecological Community	S3	Blue			
Populus trichocarpa / Salix sitchensis	black cottonwood / Sitka willow	Ecological Community	S2S3	Blue			
Pseudotsuga menziesii - Arbutus menziesii	Douglas-fir - arbutus	Ecological Community	S2	Red			
Pseudotsuga menziesii / Berberis nervosa	Douglas-fir / dull Oregon-grape	Ecological Community	S1	Red			
Pseudotsuga menziesii / Melica subulata	Douglas-fir / Alaska oniongrass	Ecological Community	S1	Red			
Pseudotsuga menziesii / Polystichum munitum	Douglas-fir / sword fern	Ecological Community	S2	Red			
Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	Ecological Community	S2	Red			
Quercus garryana / Bromus carinatus	Garry oak / California brome	Ecological Community	S1	Red			
Quercus garryana / Holodiscus discolor	Garry oak / oceanspray	Ecological Community	S1	Red			
Rhododendron groenlandicum / Kalmia microphylla / Sphagnum spp.	Labrador-tea / western bog-laurel / peat-mosses	Ecological Community	S3	Blue			
Ruppia maritima Herbaceous Vegetation	beaked ditch-grass Herbaceous Vegetation	Ecological Community	S2	Red			
Salix sitchensis / Carex sitchensis	Sitka willow / Sitka sedge	Ecological Community	S3	Blue			
Salix sitchensis - Salix lasiandra var. lasiandra / Lysichiton americanus	Sitka willow - Pacific willow / skunk cabbage	Ecological Community	S2	Red			
Sarcocornia pacifica - Lysimachia maritima	American glasswort - sea-milkwort	Ecological Community	S2	Red			
Schoenoplectus acutus Deep Marsh	hard-stemmed bulrush Deep Marsh	Ecological Community	S3	Blue			
Selaginella wallacei / Cladina spp.	Wallace's selaginella / reindeer lichens	Ecological Community	S3	Blue			
Sidalcea hendersonii Tidal Marsh	Henderson's checker-mallow Tidal Marsh	Ecological Community	S1	Red			
Thuja plicata / Achlys triphylla	western redcedar / vanilla-leaf	Ecological Community	S1	Red			
Thuja plicata / Carex obnupta	western redcedar / slough sedge	Ecological Community	S1S2	Red			
Thuja plicata / Lonicera involucrata	western redcedar / black twinberry	Ecological Community	S1	Red			
Thuja plicata / Oemleria cerasiformis	western redcedar / Indian-plum	Ecological Community	S1	Red			
Thuja plicata - Picea sitchensis / Lysichiton americanus	western redcedar - Sitka spruce / skunk	Ecological Community	S3?	Blue			
Thuja plicata / Polystichum munitum - Lysichiton americanus	western redcedar / sword fern - skunk	Ecological Community	S3?	Blue			
Thuja plicata / Polystichum munitum Dry Maritime	western redcedar / sword fern Dry Maritime	Ecological Community	S2?	Red			
Thuja plicata / Polystichum munitum Very Dry Maritime	western redcedar / sword fern Very Dry	Ecological Community	S2S3	Blue			
Thuja plicata - Pseudotsuga menziesii / Eurhynchium oreganum	western redcedar - Douglas-fir / Oregon	Ecological Community	S1	Red			
Thuja plicata / Rubus spectabilis	western redcedar / salmonberry	Ecological Community	S1S2	Red			
Thuja plicata / Symphoricarpos albus	western redcedar / common snowberry	Ecological Community	S1	Red			
Thuja plicata / Tiarella trifoliata Dry Maritime	western redcedar / three-leaved foamflower	Ecological Community	S2S3	Blue			
Thuja plicata / Tiarella trifoliata Very Dry Maritime	western redcedar / three-leaved foamflower	Ecological Community	S2S3	Blue			
Thuja plicata - Tsuga heterophylla / Polystichum munitum	western redcedar - western hemlock / sword	Ecological Community	S3?	Blue			
Tsuga heterophylla - Abies amabilis / Struthiopteris spicant	western hemlock - amabilis fir / deer fern	Ecological Community	S3	Blue			
Tsuga heterophylla / Buckiella undulata	western hemlock / flat-moss	Ecological Community	S3	Blue			
Tsuga heterophylla - Pseudotsuga menziesii / Eurhynchium oreganum	western hemlock - Douglas-fir / Oregon beaked-moss	Ecological Community	S2	Red			
Tsuga heterophylla - Thuja plicata / Gaultheria shallon Very Wet Maritime	western hemlock - western redcedar / salal Very Wet Maritime	Ecological Community	S3?	Blue			
Tsuga heterophylla - Thuja plicata / Struthiopteris spicant	western hemlock - western redcedar / deer	Ecological Community	S2	Red			
Typha latifolia Marsh	common cattail Marsh	Ecological Community	S3	Blue			
Bartramia aprica	rigid apple moss	Nonvascular Plant	S2	Red	Endangered	1	Endangered
Brotherella roellii	Roell's brotherella	Nonvascular Plant	S1S2	Red	Endangered	1	Endangered
Entosthodon fascicularis	banded cord-moss	Nonvascular Plant	S2S3	Blue	Special Concern	1	Special Concern
Fabronia pusilla	silver hair moss	Nonvascular Plant	SH	Red	Endangered	1	Endangered
Fissidens pauperculus	poor pocket moss	Nonvascular Plant	S1	Red	Endangered	1	Endangered
Seligeria acutifolia	acuteleaf small limestone moss	Nonvascular Plant	S1	Red	Endangered		
Syntrichia laevipila	twisted oak moss	Nonvascular Plant	S3	Blue	Special Concern	1	Special Concern
Abronia latifolia	yellow sand-verbena	Vascular Plant	S3	Blue			
Acorus americanus	American sweet-flag	Vascular Plant	S3	Blue			
Actaea elata var. elata	tall bugbane	Vascular Plant	S1S2	Red	Endangered	1	Endangered
Allium amplectens	slimleaf onion	Vascular Plant	S3	Blue			
Arceuthobium tsugense ssp. mertensianae	mountain hemlock dwarf mistletoe	Vascular Plant	S3	Blue			
Berula erecta	cut-leaved water-parsnip	Vascular Plant	S3?	Blue			
Bidens amplissima	Vancouver Island beggarticks	Vascular Plant	S3	Blue	Special Concern	1	Special Concern
Calystegia soldanella	beach bindweed	Vascular Plant	S3	Blue			
Camissonia contorta	contorted-pod evening-primrose	Vascular Plant	S1	Red	Endangered	1	Endangered
Carex tumulicola	foothill sedge	Vascular Plant	S3S4	Yellow	Endangered	1	Endangered

Castilleja levisecta	golden paintbrush	Vascular Plant	S1	Red	Endangered	1	Endangered
Castilleja victoriae	Victoria's owl-clover	Vascular Plant	S1	Red	Endangered	1	Endangered
Cephalanthera austiniae	phantom orchid	Vascular Plant	S2	Red	Endangered	1	Threatened
Claytonia washingtoniana	Washington springbeauty	Vascular Plant	S2	Red			
Crassula connata	Erect Pigmyweed	Vascular Plant	S2S3	Blue			
Dryopteris arguta	coastal wood fern	Vascular Plant	S3	Blue	Special Concern	1	Special Concern
Hosackia gracilis	seaside bird's foot lotus	Vascular Plant	S2	Red	Endangered	1	Endangered
Lathyrus littoralis	silky beach pea	Vascular Plant	S2	Red	Threatened		
Limnanthes macounii	Macoun's meadow-foam	Vascular Plant	S2?	Red	Threatened	1	Threatened
Lindernia dubia var. dubia	yellowseed false pimpernel	Vascular Plant	S3?	Blue			
Lomatium dissectum	fern-leaved desert-parsley	Vascular Plant	S2	Red			
Lupinus microcarpus var. microcarpus	dense-flowered lupine	Vascular Plant	S1	Red	Endangered	1	Endangered
Lupinus oreganus var. kincaidii	Kincaid's lupine	Vascular Plant	SU	Unknown	Extirpated	1	Extinct
Lupinus rivularis	streambank lupine	Vascular Plant	S1	Red	Endangered	1	Endangered
Meconella oregana	white meconella	Vascular Plant	S1S2	Red	Endangered	1	Endangered
Microseris bigelovii	coast microseris	Vascular Plant	S2	Red	Endangered	1	Endangered
Nuttallanthus texanus	Texas toadflax	Vascular Plant	S3	Blue			
Orthocarpus bracteosus	rosy owl-clover	Vascular Plant	S1	Red	Endangered	1	Endangered
Pinus albicaulis	whitebark pine	Vascular Plant	S2S3	Blue	Endangered	1	Endangered
Plagiobothrys figuratus ssp. figuratus	fragrant popcornflower	Vascular Plant	S1	Red	Endangered	1	Endangered
Polygonum paronychia	black knotweed	Vascular Plant	S3	Blue			
Polystichum californicum	California Sword-fern	Vascular Plant	S1	Red			
Polystichum setigerum	Alaska holly fern	Vascular Plant	S3	Blue			
Psilocarphus elatior	tall woolly-heads	Vascular Plant	S2	Red	Endangered	1	Endangered
Pyrola aphylla	leafless wintergreen	Vascular Plant	S3	Blue			
Ranunculus alismifolius var. alismifolius	water-plantain buttercup	Vascular Plant	S1	Red	Endangered	1	Endangered
Ranunculus californicus	California buttercup	Vascular Plant	S2	Red	Endangered	1	Endangered
Sabulina pusilla	dwarf sandwort	Vascular Plant	S1	Red	Endangered	1	Endangered
Sanicula arctopoides	bear's-foot sanicle	Vascular Plant	S2	Red	Threatened	1	Endangered
Sanicula bipinnatifida	purple sanicle	Vascular Plant	S2	Red	Threatened	1	Threatened
Sericocarpus rigidus	white-top aster	Vascular Plant	S3	Blue	Special Concern	1	Special Concern
Sidalcea hendersonii	Henderson's checker-mallow	Vascular Plant	S3	Blue			
Silene scouleri ssp. scouleri	coastal Scouler's catchfly	Vascular Plant	S1	Red	Endangered	1	Endangered
Sisyrinchium idahoense var. segetum	Idaho blue-eyed-grass	Vascular Plant	S1	Red			
Trifolium depauperatum var. depauperatum	poverty clover	Vascular Plant	S3	Blue			
Trifolium dichotomum	Macrae's clover	Vascular Plant	S2S3	Blue			
Triphysaria versicolor ssp. versicolor	bearded owl-clover	Vascular Plant	S1	Red	Endangered	1	Endangered
Triteleia howellii	Howell's triteleia	Vascular Plant	S1	Red	Endangered	1	Endangered
Utricularia ochroleuca	ochroleucous bladderwort	Vascular Plant	S2S3	Blue			
Veronica catenata	pink water speedwell	Vascular Plant	S3	Blue			
Woodwardia fimbriata	giant chain fern	Vascular Plant	S3	Blue			

Scientific Name	English Name	Group	Name Category	Prov Status	BC List	COSEWIC	SARA Schedule	SARA Status	Migratory Bird Convention Act
Stygobromus quatsinensis	Quatsino Cave Amphipod	Amphipod	Invertebrate Animal	S2S3	Blue				
Bombus occidentalis	Western Bumble Bee	Bee	Invertebrate Animal	S2S4	Blue	Threatened			
Cicindela hirticollis	Hairy-necked Tiger Beetle	Beetle	Invertebrate Animal	S2S4	Blue				
Omus audouini	Audouin's Night-stalking Tiger Beetle	Beetle	Invertebrate Animal	S1	Red	Threatened	1	Threatened	
Musculium partumeium	Swamp Fingernailclam	Bivalve	Invertebrate Animal	S2S4	Blue				
Musculium transversum	Long Fingernailclam	Bivalve	Invertebrate Animal	S3S5	Blue				
Sphaerium occidentale	Herrington Fingernailclam	Bivalve	Invertebrate Animal	S2S3	Blue				
Sphaerium patella	Rocky Mountain Fingernailclam	Bivalve	Invertebrate Animal	SH	Red				
Sphaerium striatinum	Striated Fingernailclam	Bivalve	Invertebrate Animal	S3S4	Blue				
Argia emma	Emma's Dancer	Butterfly	Invertebrate Animal	S3S4	Blue				
Argia vivida	Vivid Dancer	Butterfly	Invertebrate Animal	S2S3	Blue	Special Concern	1	Special Concern	
Callophrys eryphon sheltonensis	Western Pine Elfin, *sheltonensis* subspecies	Butterfly	Invertebrate Animal	S3	Blue				
Callophrys johnsoni	Johnson's Hairstreak	Butterfly	Invertebrate Animal	S2?	Red				
Callophrys mossii mossii	Moss' Elfin, *mossii* subspecies	Butterfly	Invertebrate Animal	S2S3	Blue				
Cercyonis pegala incana	Common Wood-nymph, *incana* subspecies	Butterfly	Invertebrate Animal	S2	Red				
Chlosyne hoffmanni	Hoffman's Checkerspot	Butterfly	Invertebrate Animal	S2	Red				
Coenonympha tullia insulana	Common Ringlet, *insulana* subspecies	Butterfly	Invertebrate Animal	S1	Red				
Danaus plexippus	Monarch	Butterfly	Invertebrate Animal	S1?B	Red	Endangered	1	Special Concern	
Epargyreus clarus	Silver-spotted Skipper	Butterfly	Invertebrate Animal	S3	Blue				
Epargyreus clarus californicus	Silver-spotted Skipper, *californicus*	Butterfly	Invertebrate Animal	S1	Red				
Erynnis propertius	Propertius Duskywing	Butterfly	Invertebrate Animal	S2	Red				
Euchloe ausonides insulanus	Large Marble, *insulanus* subspecies	Butterfly	Invertebrate Animal	SX	Red	Extirpated	1	Extinct	
Euphydryas editha taylori	Edith's Checkerspot, *taylori* subspecies	Butterfly	Invertebrate Animal	S1	Red	Endangered	1	Endangered	
Euphyes vestris	Dun Skipper	Butterfly	Invertebrate Animal	S2S3	Blue	Threatened	1	Threatened	
Hesperia colorado oregonia	Western Branded Skipper, *oregonia*	Butterfly	Invertebrate Animal	S1	Red	Endangered			
Icaricia icarioides blackmorei	Boisduval's Blue, *blackmorei* subspecies	Butterfly	Invertebrate Animal	S3	Blue				
Icaricia saepiolus insulanus	Greenish Blue, *insulanus* subspecies	Butterfly	Invertebrate Animal	SH	Red	Endangered	1	Endangered	
Pachydiplax longipennis	Blue Dasher	Butterfly	Invertebrate Animal	S3S4	Blue				
Papilio indra	Indra Swallowtail	Butterfly	Invertebrate Animal	S1	Red				
Parnassius clodius claudianus	Clodius Parnassian, *claudianus* subspecies	Butterfly	Invertebrate Animal	S3S4	Blue				
Parnassius clodius pseudogallatinus	Clodius Parnassian, *pseudogallatinus*	Butterfly	Invertebrate Animal	S3S4	Blue				
Parnassius smintheus olympiannus	Rocky Mountain Parnassian, *olympiannus*	Butterfly	Invertebrate Animal	S2S3	Blue				
Speyeria zerene bremnerii	Zerene Fritillary, *bremnerii* subspecies	Butterfly	Invertebrate Animal	S2	Red				
Enallagma clausum	Alkali Bluet	Damselfly	Invertebrate Animal	S3	Blue				
Erythemis collocata	Western Pondhawk	Dragonfly	Invertebrate Animal	S3S4	Blue				
Macromia magnifica	Western River Cruiser	Dragonfly	Invertebrate Animal	S3	Blue				
Octogomphus specularis	Grappletail	Dragonfly	Invertebrate Animal	S2	Red				
Ophiogomphus occidentis	Sinuous Snaketail	Dragonfly	Invertebrate Animal	S3	Blue				
Sympetrum vicinum	Autumn Meadowhawk	Dragonfly	Invertebrate Animal	S3S4	Blue				
Tanypteryx hageni	Black Petaltail	Dragonfly	Invertebrate Animal	S3	Blue				
Tramea lacerata	Black Saddlebags	Dragonfly	Invertebrate Animal	S2	Red				
Arctiostrotus perrieri		Earthworm	Invertebrate Animal	S3?	Blue				
Allogona townsendiana	Oregon Forestsnail	Gastropod	Invertebrate Animal	S2	Red	Endangered	1	Endangered	
Carychium occidentale	Western Thorn	Gastropod	Invertebrate Animal	S3	Blue				
Cryptomastix devia	Puget Oregonian	Gastropod	Invertebrate Animal	SX	Red	Extirpated	1	Extinct	
Deroceras hesperium	Evening Fieldslug	Gastropod	Invertebrate Animal	SH	Red	Data Deficient			
Galba bulimoides	Prairie Fossaria	Gastropod	Invertebrate Animal	S3?	Blue				
Galba dalli	Dusky Fossaria	Gastropod	Invertebrate Animal	S3S4	Blue				
Galba parva	Pygmy Fossaria	Gastropod	Invertebrate Animal	S3S5	Blue				
Galba vancouverensis	Vancouver Fossaria	Gastropod	Invertebrate Animal	SH	Red				
Gyraulus crista	Star Gyro	Gastropod	Invertebrate Animal	S3S4	Blue				
Hemphillia dromedarius	Dromedary Jumping-slug	Gastropod	Invertebrate Animal	S2	Red	Threatened	1	Threatened	
Hemphillia glandulosa	Warty Jumping-slug	Gastropod	Invertebrate Animal	S2?	Red	Special Concern	1	Special Concern	
Nearctula sp. 1	Threaded Vertigo	Gastropod	Invertebrate Animal	S3	Blue	Special Concern	1	Special Concern	
Physella propinqua	Rocky Mountain Physa	Gastropod	Invertebrate Animal	S3S4	Blue				
Physella virginea	Sunset Physa	Gastropod	Invertebrate Animal	S3S5	Blue				
Planorbula campestris	Meadow Rams-horn	Gastropod	Invertebrate Animal	S3S4	Blue				
Pristiloma johnsoni	Broadwhorl Tightcoil	Gastropod	Invertebrate Animal	S3	Blue				
Promenetus umbilicatellus	Umbilicate Sprite	Gastropod	Invertebrate Animal	S2S3	Blue				
Prophysaon coeruleum	Blue-grey Taildropper	Gastropod	Invertebrate Animal	S2S3	Blue	Threatened	1	Endangered	
Stagnicola caperata	Wrinkled Marshsnail	Gastropod	Invertebrate Animal	S3S4	Blue				
Stagnicola traski	Widelip Pondsnail	Gastropod	Invertebrate Animal	S3S4	Blue				
Haliotis kamtschatkana	Northern Abalone	Marine Mollusc	Invertebrate Animal	S2	Red	Endangered	1	Endangered	
Ostrea lurida	Olympia Oyster	Marine Mollusc	Invertebrate Animal	S3	Blue	Special Concern	1	Special Concern	
Anarta edwardsii	Edwards' Beach Moth	Moth	Invertebrate Animal	S1	Red	Endangered	1	Endangered	
Copablepharon fuscum	Sand-verbena Moth	Moth	Invertebrate Animal	S1	Red	Endangered	1	Endangered	
Gnaphosa snohomish	Georgia Basin Bog Spider	Spider	Invertebrate Animal	S2	Red	Special Concern	1	Special Concern	
Anaxyrus boreas	Western Toad	Amphibian	Vertebrate Animal	S4	Yellow	Special Concern	1	Special Concern	
Aneides vagrans	Wandering Salamander	Amphibian	Vertebrate Animal	S3	Blue	Special Concern	1	Special Concern	
Ascaphus truei	Coastal Tailed Frog	Amphibian	Vertebrate Animal	S4	Yellow	Special Concern	1	Special Concern	
Dicamptodon tenebrosus	Coastal Giant Salamander	Amphibian	Vertebrate Animal	S2S3	Blue	Threatened	1	Threatened	
Lithobates pipiens	Northern Leopard Frog	Amphibian	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Rana aurora	Northern Red-legged Frog	Amphibian	Vertebrate Animal	S3	Blue	Special Concern	1	Special Concern	
Rana pretiosa	Oregon Spotted Frog	Amphibian	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Accipiter gentilis laingi	Northern Goshawk, *laingi* subspecies	Bird	Vertebrate Animal	S2	Red	Threatened	1	Threatened	
Aechmophorus occidentalis	Western Grebe	Bird	Vertebrate Animal	S1B,S2N	Red	Special Concern	1	Special Concern	Y
Aeronautes saxatalis	White-throated Swift	Bird	Vertebrate Animal	S3S4B	Blue				Y
Ammodramus savannarum	Grasshopper Sparrow	Bird	Vertebrate Animal	S1B	Red				Y
Ammospiza nelsoni	Nelson's Sparrow	Bird	Vertebrate Animal	S2B	Red	Not at Risk			Y
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	Bird	Vertebrate Animal	S2S3B,S4N	Blue	Special Concern	1	Special Concern	
Asio flammeus	Short-eared Owl	Bird	Vertebrate Animal	S3B,S2N	Blue	Special Concern	1	Special Concern	
Athene cunicularia	Burrowing Owl	Bird	Vertebrate Animal	S1B	Red	Endangered	1	Endangered	
Bartramia longicauda	Upland Sandpiper	Bird	Vertebrate Animal	S2B	Red				Y
Botaurus lentiginosus	American Bittern	Bird	Vertebrate Animal	S3B, SNRN	Blue				Y
Brachyramphus marmoratus	Marbled Murrelet	Bird	Vertebrate Animal	S3B,S3N	Blue	Threatened	1	Threatened	Y
Branta bernicla	Brant	Bird	Vertebrate Animal	S3M	Blue				Y
Branta canadensis occidentalis	Canada Goose, *occidentalis* subspecies	Bird	Vertebrate Animal	S2M	Red				
Buteo lagopus	Rough-legged Hawk	Bird	Vertebrate Animal	S3N	Blue	Not at Risk			
Buteo swainsoni	Swainson's Hawk	Bird	Vertebrate Animal	S2B	Red				
Butorides virescens	Green Heron	Bird	Vertebrate Animal	S3S4B	Blue				Y
Calcarius pictus	Smith's Longspur	Bird	Vertebrate Animal	S3S5B	Blue				Y
Calidris canutus	Red Knot	Bird	Vertebrate Animal	S1S2M	Red	Endangered /	1	Threatened /	Y
Cardellina canadensis	Canada Warbler	Bird	Vertebrate Animal	S3S4B	Blue	Threatened	1	Threatened	Y
Chondestes grammacus	Lark Sparrow	Bird	Vertebrate Animal	S3S4B	Blue				Y
Chordeiles minor	Common Nighthawk	Bird	Vertebrate Animal	S4B	Yellow	Special Concern	1	Threatened	Y
Coccothraustes vespertinus	Evening Grosbeak	Bird	Vertebrate Animal	S5	Yellow	Special Concern	1	Special Concern	Y
Coccyzus americanus	Yellow-billed Cuckoo	Bird	Vertebrate Animal	SXB	Red				Y
Contopus cooperi	Olive-sided Flycatcher	Bird	Vertebrate Animal	S3S4B	Blue	Special Concern	1	Threatened	Y
Cygnus columbianus	Tundra Swan	Bird	Vertebrate Animal	S3N	Blue				Y
Cypseloides niger	Black Swift	Bird	Vertebrate Animal	S2S3B	Blue	Endangered	1	Endangered	Y
Dolichonyx oryzivorus	Bobolink	Bird	Vertebrate Animal	S3B	Blue	Threatened	1	Threatened	Y
Eremophila alpestris strigata	Horned Lark, *strigata* subspecies	Bird	Vertebrate Animal	SXB	Red	Endangered	1	Endangered	
Euphagus carolinus	Rusty Blackbird	Bird	Vertebrate Animal	S3S4B	Blue	Special Concern	1	Special Concern	
Falco peregrinus pealei	Peregrine Falcon, *pealei* subspecies	Bird	Vertebrate Animal	S3S4	Blue	Special Concern	1	Special Concern	
Falco rusticolus	Gyrfalcon	Bird	Vertebrate Animal	S3S4B, SNRN	Blue	Not at Risk			
Glaucidium gnoma swarthi	Northern Pygmy-owl, *swarthi* subspecies	Bird	Vertebrate Animal	S3S4	Blue				

Hirundo rustica	Barn Swallow	Bird	Vertebrate Animal	S3S4B	Blue	Threatened	1	Threatened	Y
Hydroprogne caspia	Caspian Tern	Bird	Vertebrate Animal	S3B	Blue	Not at Risk			Y
Icteria virens	Yellow-breasted Chat	Bird	Vertebrate Animal	S2B	Red	Endangered	1	Endangered	Y
Larus californicus	California Gull	Bird	Vertebrate Animal	S2S3B	Blue				Y
Limnodromus griseus	Short-billed Dowitcher	Bird	Vertebrate Animal	S2S3B	Blue				Y
Limosa haemastica	Hudsonian Godwit	Bird	Vertebrate Animal	S1S2B	Red	Threatened			Y
Megascops kennicottii	Western Screech-Owl	Bird	Vertebrate Animal	S4	No Status	Threatened	1	Threatened	
Megascops kennicottii kennicottii	Western Screech-Owl, *kennicottii*	Bird	Vertebrate Animal	S2S3	Blue	Threatened	1	Threatened	
Melanerpes lewis	Lewis's Woodpecker	Bird	Vertebrate Animal	S2S3B	Blue	Threatened	1	Threatened	Y
Numenius americanus	Long-billed Curlew	Bird	Vertebrate Animal	S3B	Blue	Special Concern	1	Special Concern	Y
Nycticorax nycticorax	Black-crowned Night-heron	Bird	Vertebrate Animal	S1	Red				Y
Oporornis agilis	Connecticut Warbler	Bird	Vertebrate Animal	S3B	Blue				Y
Oreoscoptes montanus	Sage Thrasher	Bird	Vertebrate Animal	S1B	Red	Endangered	1	Endangered	Y
Patagioenas fasciata	Band-tailed Pigeon	Bird	Vertebrate Animal	S3S4	Blue	Special Concern	1	Special Concern	Y
Pelecanus erythrorhynchos	American White Pelican	Bird	Vertebrate Animal	S1B	Red	Not at Risk			
Phalacrocorax auritus	Double-crested Cormorant	Bird	Vertebrate Animal	S3S4	Blue	Not at Risk			
Phalacrocorax penicillatus	Brandt's Cormorant	Bird	Vertebrate Animal	S1B,S4N	Red				
Phalaropus lobatus	Red-necked Phalarope	Bird	Vertebrate Animal	S3S4B	Blue	Special Concern			Y
Pinicola enucleator carlottae	Pine Grosbeak, *carlottae* subspecies	Bird	Vertebrate Animal	S3	Blue				
Pluvialis dominica	American Golden-Plover	Bird	Vertebrate Animal	S3S4B	Blue				Y
Pooecetes gramineus affinis	Vesper Sparrow, *affinis* subspecies	Bird	Vertebrate Animal	S1B	Red	Endangered	1	Endangered	
Progne subis	Purple Martin	Bird	Vertebrate Animal	S3S4B	Blue				Y
Recurvirostra americana	American Avocet	Bird	Vertebrate Animal	S2S3B	Blue				Y
Setophaga castanea	Bay-breasted Warbler	Bird	Vertebrate Animal	S2B	Red				Y
Setophaga virens	Black-throated Green Warbler	Bird	Vertebrate Animal	S3B	Blue				Y
Sterna forsteri	Forster's Tern	Bird	Vertebrate Animal	S1B	Red	Data Deficient			Y
Strix occidentalis	Spotted Owl	Bird	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Tringa incana	Wandering Tattler	Bird	Vertebrate Animal	S3B	Blue				Y
Tyto alba	Barn Owl	Bird	Vertebrate Animal	S2?	Red	Threatened	1	Threatened	
Acipenser medirostris	Green Sturgeon	Fish	Vertebrate Animal	S2S3N	Blue	Special Concern	1	Special Concern	
Acipenser transmontanus	White Sturgeon	Fish	Vertebrate Animal	S2	No Status	Endangered /	1	Endangered	
Acipenser transmontanus pop. 4	White Sturgeon (Lower Fraser River	Fish	Vertebrate Animal	S1S2	Red	Threatened			
Catostomus platyrhynchus	Mountain Sucker	Fish	Vertebrate Animal	S3?	Blue	Special Concern	1	Special Concern	
Catostomus sp. 4	Salish Sucker	Fish	Vertebrate Animal	S2	Red	Threatened	1	Threatened	
Cottus aleuticus pop. 1	Coastrange Sculpin, Cultus Population	Fish	Vertebrate Animal	S1S2	Red	Endangered	1	Threatened	
Gasterosteus aculeatus pop. 2	Little Quarry Lake Benthic Threespine	Fish	Vertebrate Animal	S1	Red	Threatened			
Gasterosteus aculeatus pop. 3	Little Quarry Limnetic Threespine	Fish	Vertebrate Animal	S1	Red	Threatened			
Gasterosteus sp. 16	Vananda Creek Limnetic Stickleback	Fish	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Gasterosteus sp. 17	Vananda Creek Benthic Stickleback	Fish	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Gasterosteus sp. 2	Enos Lake Limnetic Stickleback	Fish	Vertebrate Animal	SX	Red	Endangered	1	Endangered	
Gasterosteus sp. 3	Enos Lake Benthic Stickleback	Fish	Vertebrate Animal	SX	Red	Endangered	1	Endangered	
Gasterosteus sp. 4	Paxton Lake Limnetic Stickleback	Fish	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Gasterosteus sp. 5	Paxton Lake Benthic Stickleback	Fish	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Hybognathus hankinsoni - Pacific group	Brassy Minnow - Pacific Group	Fish	Vertebrate Animal	S2S3	Blue				
Oncorhynchus clarkii clarkii	Cutthroat Trout, *clarkii* subspecies	Fish	Vertebrate Animal	S3S4	Blue				
Rhinichthys cataractae - Chehalis lineage	Nooksack Dace	Fish	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Salvelinus confluentus	Bull Trout	Fish	Vertebrate Animal	S3S4	Blue	Special Concern			
Spirinchus sp. 1	Pygmy Longfin Smelt	Fish	Vertebrate Animal	S2	Red	Data Deficient			
Lampetra richardsoni pop. 1	Western Brook Lamprey (Morrison Creek	Lamprey	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Aplodontia rufa	Mountain Beaver	Mammal	Vertebrate Animal	S4	Yellow	Special Concern	1	Special Concern	
Cervus elaphus roosevelti	Roosevelt Elk	Mammal	Vertebrate Animal	S3S4	Blue				
Corynorhinus townsendii	Townsend's Big-eared Bat	Mammal	Vertebrate Animal	S3S4	Blue				
Gulo gulo luscus	Wolverine, *luscus* subspecies	Mammal	Vertebrate Animal	S3	Blue	Special Concern	1	Special Concern	
Gulo gulo vancouverensis	Wolverine, *vancouverensis* subspecies	Mammal	Vertebrate Animal	SH	Red	Special Concern	1	Special Concern	
Lepus americanus washingtonii	Snowshoe Hare, *washingtonii* subspecies	Mammal	Vertebrate Animal	S1	Red				
Mustela erminea anguinae	Ermine, *anguinae* subspecies	Mammal	Vertebrate Animal	S3	Blue				
Mustela frenata altifrontalis	Long-tailed weasel, *altifrontalis* subspecies	Mammal	Vertebrate Animal	SH	Red				
Myodes gapperi occidentalis	Southern Red-backed Vole, *occidentalis*	Mammal	Vertebrate Animal	S1	Red				
Myotis lucifugus	Little Brown Myotis	Mammal	Vertebrate Animal	S4	Yellow	Endangered	1	Endangered	
Myotis thysanodes	Fringed Myotis	Mammal	Vertebrate Animal	S3	Blue	Data Deficient	3		
Oreamnos americanus	Mountain Goat	Mammal	Vertebrate Animal	S3	Blue				
Scapanus townsendii	Townsend's Mole	Mammal	Vertebrate Animal	S1	Red	Endangered	1	Endangered	
Sorex bendirii	Pacific Water Shrew	Mammal	Vertebrate Animal	S2?	Red	Endangered	1	Endangered	
Sorex navigator brooksi	Western Water Shrew, brooksi subspecies	Mammal	Vertebrate Animal	S2S3	Blue				
Sorex rohweri	Olympic Shrew	Mammal	Vertebrate Animal	S2?	Red				
Sorex trowbridgii	Trowbridge's Shrew	Mammal	Vertebrate Animal	S3	Blue				
Ursus arctos	Grizzly Bear	Mammal	Vertebrate Animal	S3?	Blue	Special Concern	1	Special Concern	
Charina bottae	Northern Rubber Boa	Reptile	Vertebrate Animal	S4	Yellow	Special Concern	1	Special Concern	
Contia tenuis	Sharp-tailed Snake	Reptile	Vertebrate Animal	S1S2	Red	Endangered	1	Endangered	
Pituophis catenifer	Gopher Snake	Reptile	Vertebrate Animal	S3	No Status		1	Extinct /	
Pituophis catenifer catenifer	Gopher Snake, *catenifer* subspecies	Reptile	Vertebrate Animal	SX	Red	Extirpated	1	Extinct	
Actinemys marmorata	Western Pond Turtle	Turtle	Vertebrate Animal	SX	Red	Extirpated	1	Extinct	
Chrysemys picta	Painted Turtle	Turtle	Vertebrate Animal	S3	No Status	Endangered / Special	1	Endangered /	
Chrysemys picta pop. 1	Painted Turtle - Pacific Coast Population	Turtle	Vertebrate Animal	S1S2	Red	Threatened	1	Endangered	

Appendix I

ARCHAEOLOGICAL CONSTRAINT REPORT

Stantec

Review of Archaeological Constraints

Project No.: 110904209

CTS Transmission Integrity Management Capability Project

Prepared for:

FortisBC Energy Inc.

FORTIS BC™

Prepared by:

Stantec Consulting Ltd.

Document Number:

M-0002-ARC-REP-0001

Revision: 1

2020-11-05

Sign-off Sheet

This document entitled Review of Archaeological Constraints. was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of FortisBC Energy Inc. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by: Sean McKnight Digitally signed by Sean McKnight Date: 2020.11.05 16:11:15 -08'00'

(signature)

Sean McKnight, RPCA

Reviewed by: Ryan Spady Digitally signed by Ryan Spady Date: 2020.11.05 16:08:51 -08'00'

(signature)

Ryan Spady, BA, RPCA

Approved by: Jonathan Hall Digitally signed by Jonathan Hall Date: 2020.11.05 16:05:47 -08'00'

(signature)

Jonathan Hall, MA, RPCA

Revision Information

Rev	Date	Issue Status	Description of Changes	Prepared	Reviewed	Approved
0	2020-10-16	Issued for Use	Changed from Memo to Report format	Sean McKnight	Ryan Spady	Jonathan Hall
1	2020-11-05	Re-Issued for Use	Per Fortis, removed LIV PAT, removed Balfour, and added Anmore facility	Sean McKnight	Ryan Spady	Jonathan Hall

Table of Contents

List of Tables

List of Appendices

Executive Summary

At the request of FortisBC Energy Inc. (FEI), Stantec Consulting Ltd. (Stantec) completed a desktop review of archaeological constraints associated with the Coastal Transmission System Transmission Integrity Management Capability (CTS TIMC) Project. The Project consists of the replacement of 13 existing segments ("Events") on six existing gas pipelines and work at 13 existing facilities.

The review supports the Class 3 Cost Estimate that was prepared for the anticipated scope of archaeological services that will be needed for construction of the Project. This report presents the results of the review. The Class 3 Cost Estimate is presented in a separate memo.

The objectives of the review are 1) to provide a high-level summary of known archaeological constraints for the proposed route, and 2) to gather information about archaeological potential and existing conditions to support the preparation of a Class 3 cost estimate for future archaeological work for the proposed route. We understand that FEI intends to engage with Indigenous groups at a future stage of the Project and as such Indigenous engagement was not undertaken as part of this review.

The review did not identify any conflicts between the Project and recorded archaeological sites. One facility (Fraser Gate Station) was assessed as part of an Archaeological Overview Assessment (AOA) completed by Stantec in 2014 as having low archaeological potential and no further archaeological study is recommended. One of the Events (HUN ROE 1067 Event 12) and one of the facilities (Huntingdon) are within areas modelled as having high archaeological potential on the Province's Remote Access to Archaeological Data application. However, most of the Events and facilities are within areas of the Lower Mainland without any potential model coverage and the absence of modelled potential does not indicate the other areas have low potential. All of the Events and facilities other than Fraser Gate Station may have elevated archaeological potential and should be subject to further assessment through AOA and/or AIA with input from Indigenous groups.

The OGC application process requires consideration of potential impacts to archaeological resources. To meet OGC requirements, applications must demonstrate a suitable level archaeological assessment. The typical process is to conduct an AOA and/or Archaeological Impact Assessment (AIA) prior to ground disturbance under an *HCA* Section 12.2 Inspection permit to assess the potential for the project to impact archaeological sites. While not a regulatory requirement, it is also best practice to apply for applicable First Nations heritage permits for AOAs and AIAs.

This review is not intended to replace an AOA and/or AIA and we recommend that one or both of these studies be completed for the Project.

Abbreviations

AIA	Archaeological Impact Assessment
AOA	Archaeological Overview Assessment
CTS TIMC	Coastal Transmission System Transmission Integrity Management Capability
FEI	FortisBC Energy Inc.
HCA	*Heritage Conservation Act*
OGC	Oil and Gas Commission
PARL	Provincial Archaeological Report Library
RAAD	Remote Access to Archaeological Data application
TWS	Temporary Work Space

1.0 Introduction

At the request of FortisBC Energy Inc. (FEI), Stantec Consulting Ltd. (Stantec) completed a desktop review of archaeological constraints associated with the the Coastal Transmission System Transmission Integrity Management Capability (CTS TIMC) Project (Figure 1). The review supports the Class 3 Cost Estimate for the anticipated scope of archaeological services for the Project. This report presents the results of the review. The Class 3 Cost Estimate is presented in a separate memo.

1.1 Project Description

The Project is being undertaken to mitigate the potential for pipeline ruptures due to stress corrosion cracking and other crack-like imperfections, and consists of a proposed program of pipeline replacements, valve assembly replacements, heavy wall assembly replacements, and pipeline exposure and re-coating at discrete locations on FEI's Coastal Transmission System.

The Project consists of the replacement of 13 existing segments ("Events") on six existing gas pipelines including and work at 13 existing facilities:

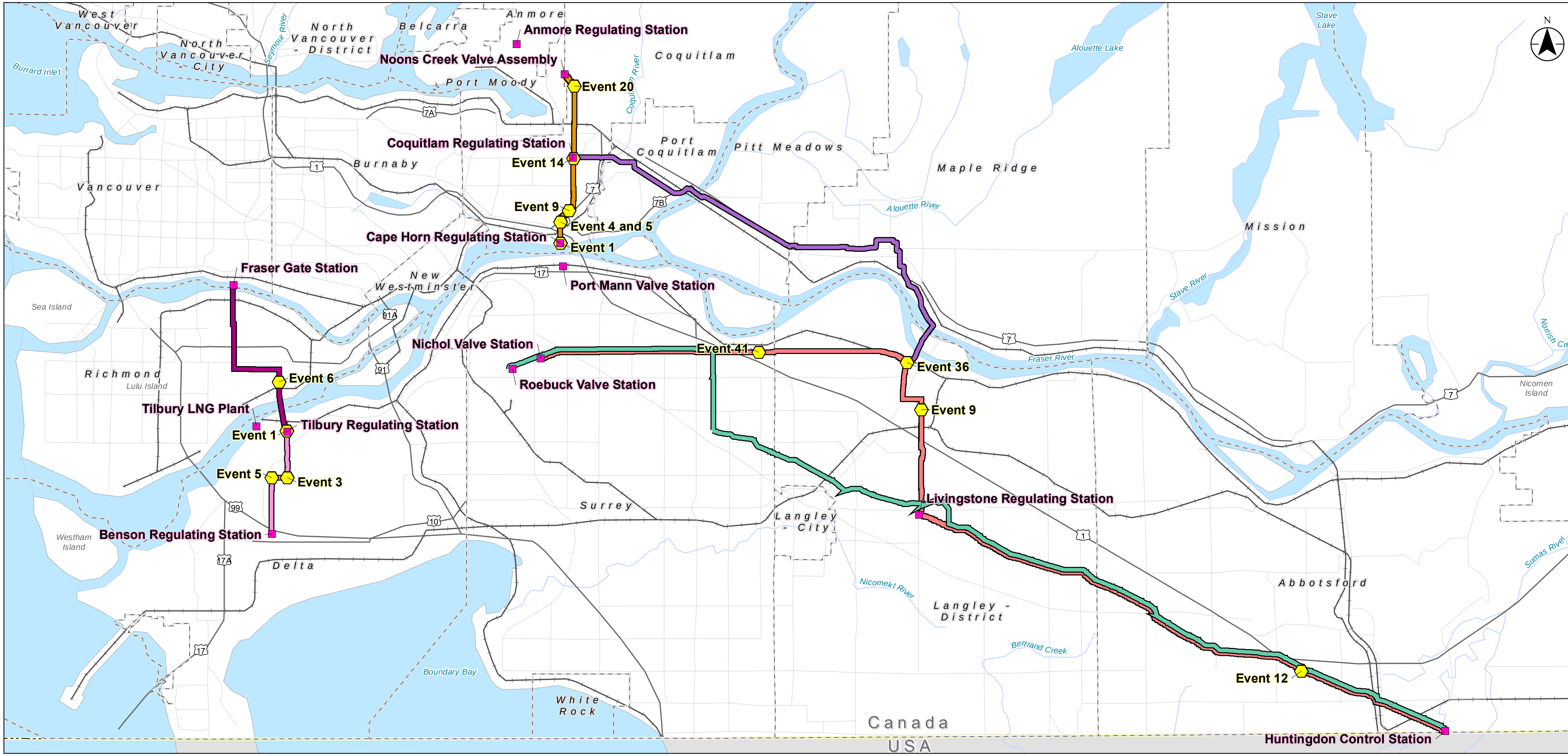
- CPH NOO—Events 1, 4 & 5 (single Event), 9, 14, 20
- HUN NIC—Events 36 and 41
- LIV COQ—Event 9
- TIL BEN—Events 3 and 5
- TIL FRA—Events 1 and 6
- HUN ROW—Event 12

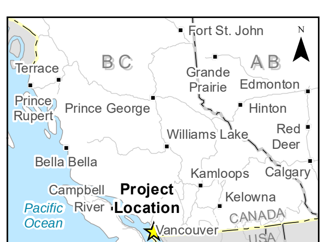
Five additional pipelines are part of the CTS TIMC Project (NIC FRA, NIC PMA, NOO BUR, ROE TIL, and TIL LNG), but as these do not have any Events associated with them there are not potential archaeological impacts or costs.

Facilities where works will take place include:

- Benson Regulating Station
- Tilbury LNG Plant
- Tilbury Regulating Station
- Fraser Gate Station
- Nichol Valve Station
- Port Mann Valve Station
- Roebuck Valve Station
- Cape Horn Regulating Station
- Coquitlam Regulating Station
- Noons Creek Valve Assembly Station
- Anmore Regulating Station Livingston Regulating Station
- Huntington Control Station

All of the facility work will be within the fence line, though temporary work spaces (TWSs) outside of the fence line will be required at six facilities (Port Mann Valve Station, Coquitlam Regulating Station, Nichol Valve Station, Cape Horn Regulating Station, and Noons Creek Valve Assembly Station). The Events identified and facilities works are in the municipalities of Abbotsford, Anmore, Coquitlam, Delta, Richmond, Port Moody, Surrey, Township of Langley, and Vancouver.





International Boundary
Highway
Road
Railway
Watercourse
Waterbody
Municipal Boundary

Facility
TIMC Event

TIMC Pipeline

CPH NOO & NC 508
HUN NIC 762
LIV COQ 323, BH MFL
TIL BEN 323
TIL FRA 508
HUN ROE 1067

0 2 4 6 8 10 km
1:200,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number 110904209
Prepared by CMELLISHIP on 20200819
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No.
1

Title
Overview Map

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_001_overview.mxd Revised: 2020-11-02 By: cmellship

2.0 Regulatory Setting

In British Columbia, heritage resources are managed in accordance with the legal requirements and conditions set forth in the *Heritage Conservation Act* (*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 and the British Columbia Oil and Gas Commission (OGC) share authority over the archaeological assessment and review processes for oil and gas developments in the province.

Pursuant to the Protocol Agreement Ministry of Sustainable Resource Management and the OGC, the OGC is responsible for making decisions regarding oil and gas developments including authorizing impacts to protected sites through issuance of alteration permits under Section 12.4 of the *HCA*. The Archaeology Branch is responsible for the issuance of permits authorizing archaeological inspections and investigations under Section 12.4 of the *HCA*. The provincial Heritage Branch is responsible for fossil sites, heritage structures and sites of historical age.

3.0 Review Methods

The objectives of the review of archaeological constraints are 1) to provide a high-level summary of known archaeological constraints for the proposed route, and 2) to gather information about archaeological potential and existing conditions to support the preparation of a Class 3 cost estimate for future archaeological work for the proposed route. The study included review of the following information sources:

- Remote Access to Archaeological Data (RAAD) application for recorded archaeological sites, historic place sites, and existing archaeological potential models.
- Provincial Archaeological Report Library (PARL) for relevant archaeological reports conducted under *HCA* permits.
- Provincial Consultative Areas Database to identify Indigenous groups and related organizations with an asserted interest in the study area.
- orthophoto imagery and Google Street View

We understand that FEI intends to engage with Indigenous groups at a future stage of the project and as such Indigenous engagement was not undertaken as part of this review. For purposes of this review archaeological constraints are defined as known archaeological sites and historic place sites; however, there may also be sites that have cultural significance or sensitivity to Indigenous groups near the Project that are identified once consultation with those groups begins. In addition, this review does not include information or other input from Indigenous groups regarding their perspectives on archaeological potential or sensitivities that should be considered in future archaeological studies.

4.0 Review Results

4.1 Potential Project Impacts

The Project includes a series of mitigation measure consisting of 1) replacing short segment of existing gas pipeline using open cut, trenchless boring or a combination of these methods, and 2) replacement of valves at existing facilities (Figure 1). Potential impacts to archaeological sites could occur during project related ground disturbance activities. Ground disturbance is anticipated during both the open cut and trenchless methods of pipeline replacement, and during valve replacement, which will extend underground. Ground disturbance within existing facilities will be by hydrovac. Ground disturbance would be restricted to the pipeline right of way and/or facility, except where a temporary workspace (TWS) is required for facility work.

4.2 Indigenous Groups

A query of the Consultative Areas Database indicates that the following Indigenous groups have asserted an interest in project area:Musqueam Indian Band

- Semiahmoo First Nation
- Tsawwassen First Nation
- Kwantlen First Nation
- Kwikwetlem First Nation
- Squamish Nation
- Tsleil-Waututh Nation
- Stz'uminus First Nation
- Halalt First Nation
- Lyackson First Nation
- Penelakut Tribe
- Katzie First Nation
- Soowahlie First Nation
- Seabird Island Band
- Skawahlook First Nation
- Shxw'ow'hamel First Nation
- Stó:lō Nation
- Stó:lō Tribal Council
- Sumas First Nation
- Peters First Nation
- Lake Cowichan First Nation
- Cowichan Tribes
- Matsqui First Nation
- Leq'á:mel First Nation

Of these groups, Musqueam Indian Band, Kwantlen First Nation, Squamish Nation, Tsleil-Waututh Nation, and the Stó:lō Research and Resource Management Centre (representing Stó:lō Nation and Stó:lō Tribal Council bands) maintain heritage permitting systems. While acquiring these permits is not a statutory requirement, as best practice archaeologists in British Columbia strive to adhere to First Nations heritage policies and permits when feasible.

4.3 Archaeological Setting and Constraints

The results of the constraints review are presented in Appendix A (Pipeline Events) and Appendix B (Facilities). Appendix C is a mapbook showing these areas in relation to recorded archaeological sites and modeled areas of archaeological potential, where those models exist.

A search of the RAAD database did not identify any recorded archaeological sites within 250 m of the Events or facilities. RAAD indicates that one Event, LIV COQ 323 Event 9, partially overlaps with the study area from a previous Archaeological Impact Assessment (AIA) (Lynch 2016); however, the AIA report does provide any relevant information specifically about the archaeological potential of, or recommendations for, that location.

In 2014, Stantec prepared an Archaeological Overview Assessment (AOA) that included the Fraser Gate Station (Stantec 2014). That station was assessed as having low archaeological potential and no further archaeological study was recommended.

One of the Events (HUN ROE 1067 Event 12) and one of the facilities (Huntingdon) are within areas of modelled high archaeological potential (Golder 1999). However, most of the Events and facilities are within areas of the Lower Mainland without any potential model coverage and the absence of modelled potential does not indicate the other areas have low potential.

All of the Events and facility upgrades are mitigations to existing infrastructure (gas pipelines and/or facilities) and it is anticipated that the ground disturbance would be mostly or entirely limited to areas that have been subject to some level of previous excavation and landscaping. While this reduces the potential for intact sites to be present, it does not preclude that displaced archaeological material or buried intact archaeological deposits could be present.

5.0 Recommendations

The OGC application process requires consideration of potential impacts to archaeological resources. To meet OGC requirements, applications must demonstrate a suitable level archaeological assessment. The typical process is to conduct an AOA and/or AIA prior to ground disturbance under an *HCA* Section 12.2 Inspection permit to assess the potential for the project to impact archaeological sites. While not a regulatory requirement, it is also best practice to apply for applicable First Nations heritage permits for AOAs and AIAs. This review is not intended to replace an AOA and/or AIA for the Project, and we recommend that one or both of these studies be completed.

6.0 Closure

We trust this information meets your requirements at this time. If you have any questions, please do not hesitate to contact the undersigned.

7.0 References

Golder. 1999. *Archaeological Review and Management Plan for the Southern Chilliwack Forest District*. Report on file with the Archaeology Branch, Victoria BC.

Lynch, S. 2016. *Archaeological Impact Assessment: Trans Mountain Expansion Project 2016 Final Report*. Heritage Inspection Permit 2013-0165. Report on file with the Archaeology Branch, Victoria BC.

Stantec Consulting Ltd. 2014. Archaeological Overview Assessment: Metro Vancouver Reinforcements Project. Report on file with the Archaeology Branch, Victoria BC.

Appendix A ARCHAEOLOGY REVIEW RESULTS SUMMARY—PIPELINE EVENTS

Pipeline	Event	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
TIL BEN 323	3	City of Delta	None	No applicable model	Replace existing 90-degree bend via open cut pipeline installation.	One day AIA and two days monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
TIL BEN 323	5	City of Delta	None	No applicable model	Replace existing 90-degree bend via open cut pipeline installation.	One day AIA and two days monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
TIL FRA 508	1	City of Delta	None	No applicable model	Replace the existing section of heavy wall in the Tilbury station and under the River Road crossing. Replacement under River Road will be accomplished via a bored (trenchless) crossing, while the remainder will be open cut.	One day AIA and two days monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation

Pipeline	Event	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
TIL FRA 508	6	City of Richmond	None	No applicable model	Replace the existing valve assembly at Nelson valve site.	One day monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
LIV COQ 323	9	Township of Langley	None	No applicable model	Replace existing heavy wall section via open cut pipeline installation. Approximately half of the work area is paved, and the replacement section includes a crossing of the existing NPS 24 Trans Mountain pipeline.	One day AIA. Assumed no monitoring will be required.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation
HUN NIC 762	36	Township of Langley	None	No applicable model	Replace the existing valve assembly at Ft. Langley Station as well as the existing 90-degree bend immediately downstream of the site. Replacement will be accomplished via open cut pipeline installation.	One day monitoring ground disturbance. Because the project area is paved AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation

Pipeline	Event	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
HUN NIC 762	41	City of Surrey	None	No applicable model	Replace the existing valve assembly at Latimer Station via open cut pipeline installation.	One day monitoring ground disturbance. Because the project area is paved AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation
CPH NOO 508	1	City of Coquitlam	None	No applicable model	Replace the existing heavy wall assembly at Cape Horn valve site.	One day monitoring ground disturbance. Because the project area is paved AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
CPH NOO 508	4 & 5	City of Coquitlam	None	No applicable model	Replace existing pipe using trenchless technique.	One day AIA and two days monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
CPH NOO 508	9	City of Coquitlam	None	No applicable model	Replace existing 50-degree bend via open cut pipeline installation.	One day AIA and one day monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation

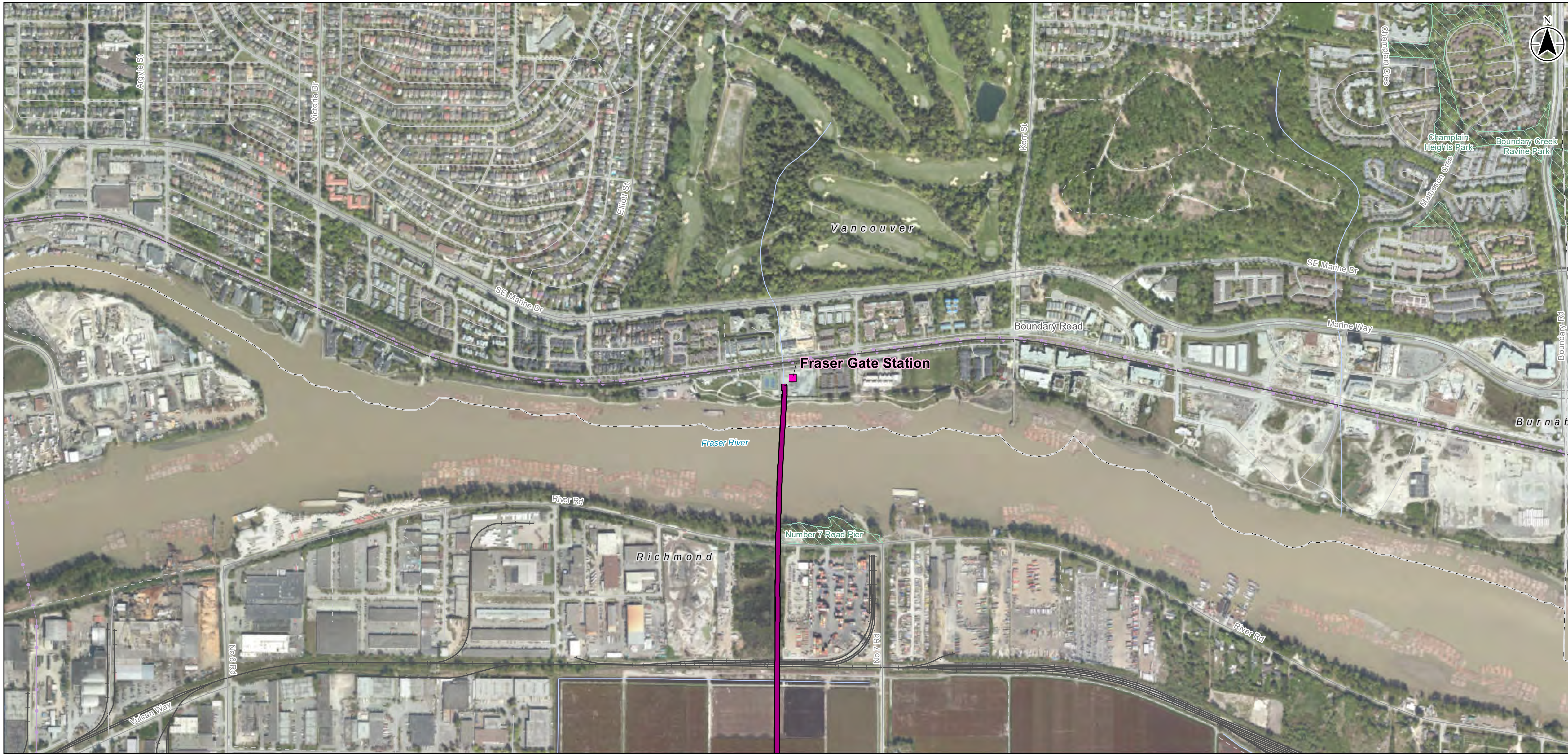
Pipeline	Event	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
CPH NOO 508	14	City of Coquitlam	None	No applicable model	Replace the existing valve assembly at Coquitlam Station.	One day monitoring ground disturbance. Because the project area is paved AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Squamish Nation
CPH NOO 508	20	City of Coquitlam	None	No applicable model	Replace the existing valve assembly at Westwood Station as well as the existing 40-degree bend and David Ave. crossing immediately upstream of the site. Replacement within the Station will be accomplished via open cut pipeline installation and bring the existing below-grade valve assembly above-grade. Replacement of the David Ave. road crossing will be accomplished via a trenchless installation.	One day AIA and one day monitoring ground disturbance	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Squamish Nation
HUN ROE 1067	12	City of Abbotsford	None	Modelled high archaeological potential (Golder 1999)	Replace the existing below-grade assembly at King Road valve site with an above-grade assembly via open cut pipeline installation.	One day monitoring ground disturbance. Because the project area is paved AIA field work is not proposed.	Stó:lō Research and Resource Management Centre, Kwantlen First Nation

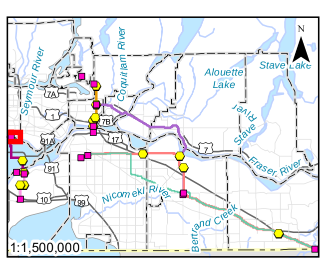
Appendix B ARCHAEOLOGY REVIEW RESULTS SUMMARY – FACILITIES

Facility	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
Benson Regulating Station	City of Delta	None	No applicable model	Work at this station would require pig barrel modifications. All work will occur within the facility and excavations would require hydrovacing.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
Tilbury LNG Plant	City of Delta	None	No applicable model	Work at this facility would require some pig barrel modifications and relocation of an above-ground assembly. All excavations at the facility would use hydrovacing.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
Tilbury Regulating Station	City of Delta	None	No applicable model	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. All work will occur within the existing facility.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
Fraser Gate Station	City of Vancouver	None	No applicable model	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. All work will occur within the existing facility.	The station was assessed as to have low potential (Stantec 2014). No further work archaeological study is recommended.	None required

Facility	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
Nichol Valve Station	City of Surrey	None	No applicable model	Facility work requires piping modifications, pig barrel modifications, and installation of pressure regulating skids. Excavation required below ground using hydrovacing. TWS is required south of the facility.	One day AIA for the TWS and one day monitoring ground disturbance within the existing facility.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation
Port Mann Valve Station	City of Surrey	None	No applicable model	Pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. TWS would be required on the south side of the facility.	One day AIA for the TWS and one day monitoring ground disturbance within the existing facility.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
Roebuck Valve Station	City of Surrey	None	No applicable model	Work will require a new pressure regulating skid, piping modifications, and pig barrel modifications. Excavation required below ground using hydrovacing. All work will occur within the existing facility.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation
Cape Horn Regulating Station	City of Coquitlam	None	No applicable model	Work at this station would require pig barrel modifications. All work will occur within the facility and excavations would require hydrovacing.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Kwantlen First Nation
Coquitlam Regulating Station	City of Coquitlam	None	No applicable model	Pressure regulating skids will be installed and modifications are proposed for piping and the pig barrel. Excavation required below ground using hydrovacing. TWS is required on an existing access road.	One day AIA for the TWS and one day monitoring ground disturbance within the existing facility.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Squamish Nation

Facility	Municipality	Recorded Archaeological Sites within 250 m	Modeled Archaeological Potential	Anticipated Ground Disturbance Activities	Assumed Scope of Archaeological Fieldwork for Class 3 Cost Estimate	Applicable First Nations Heritage Permits
Noons Creek Valve Assembly Station	City of Coquitlam	None	No applicable model	A pressure regulating skid will be installed at the facility. TWS is proposed for facility access roads immediately west and north of the facility.	One day AIA for the TWS and one day monitoring ground disturbance within the existing facility.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Tsleil-Waututh Nation, Squamish Nation
Anmore Regulating Station	Village of Anmore	None	No applicable model	Above grade piping modification	No further work archaeological study is recommended.	None required
Livingston Regulating Station	Langley - District	None	No applicable model	Work will require modification to station piping and pig barrel modification. Excavation required below ground using hydrovacing. All work will occur within the existing facility.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Musqueam Indian Band, Stó:lō Research and Resource Management Centre, Kwantlen First Nation
Huntingdon Control Station	City of Abbotsford	None	Modelled high archaeological potential (Golder 1999)	Valve, pipeline, and pig barrel modifications are required. Excavation required below ground using hydrovacing. An existing building will require work on internal equipment and replacement of a wall with a roller door. All work will occur within the existing facility.	One day monitoring ground disturbance. Because the project area is within the existing facility AIA field work is not proposed.	Stó:lō Research and Resource Management Centre, Kwantlen First Nation





Road
Local Street
Resource Road
Trail
Railway
Transmission Line
Watercourse
Local Greenspace
Municipal Boundary
Facility
TIL FRA 508

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

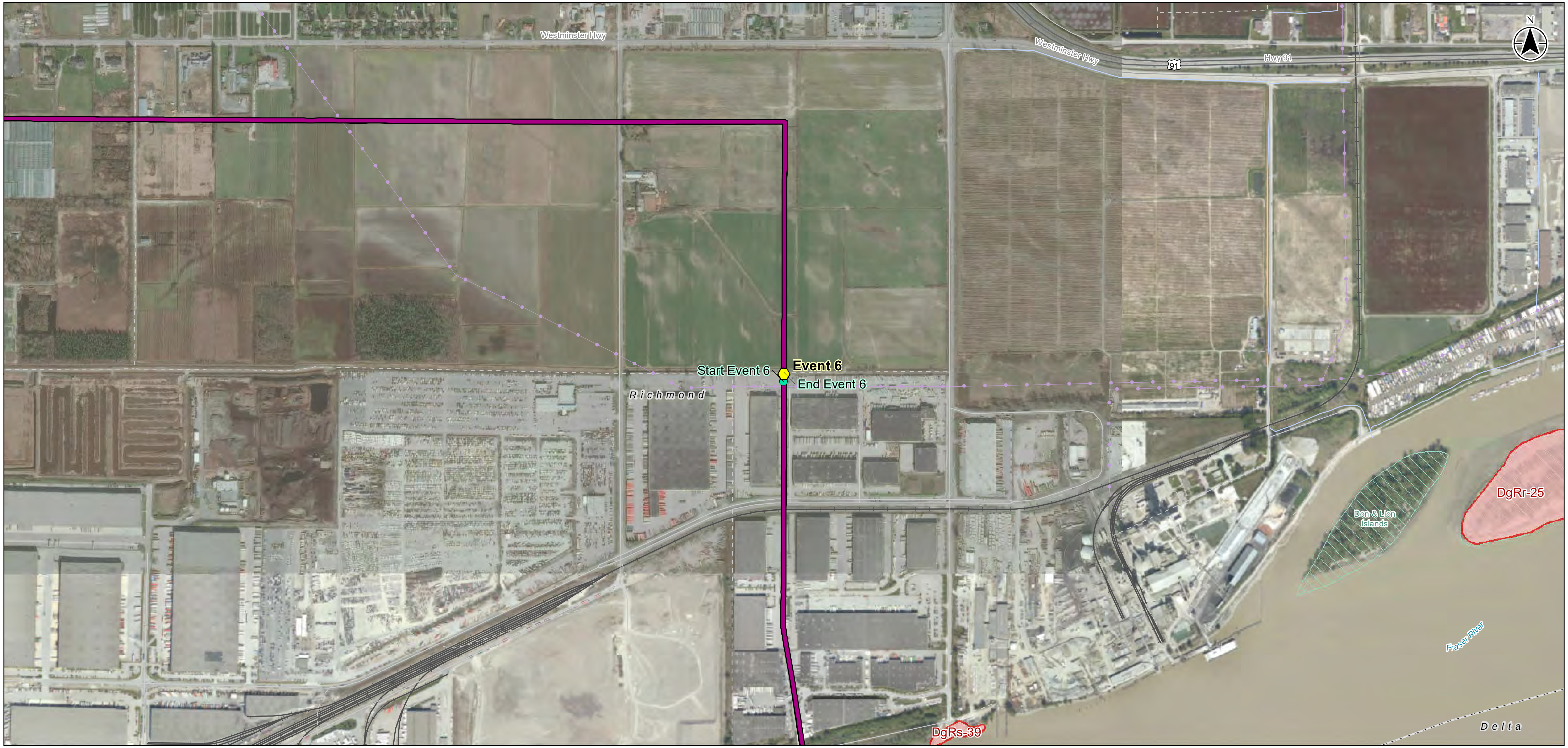
Project Location
Lower Mainland, BC

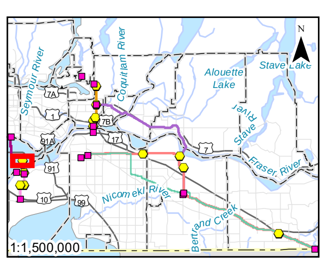
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 1 of 17

Title
Midrange Map
Fraser Gate Station





Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

Highway
Road
Local Street
Resource Road
Railway
Transmission Line
Watercourse
Local Greenspace
Municipal Boundary

TIMC Feature
TIMC Event
TIL FRA 508
Archaeological Site - Previously Recorded

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec
FORTIS BC

Project Location
Lower Mainland, BC

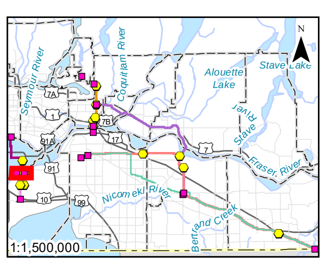
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No.	Page No.
2	2 of 17

Title
Midrange Map
Event 6

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship



Highway
Road
Local Street
Resource Road
Railway
Transmission Line
Watercourse
Wetland
Local Greenspace
Municipal Boundary

Facility
TIMC Feature
TIMC Event
TIL BEN 323
TIL FRA 508
Archaeological Site - Legacied
Archaeological Site - Previously Recorded

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

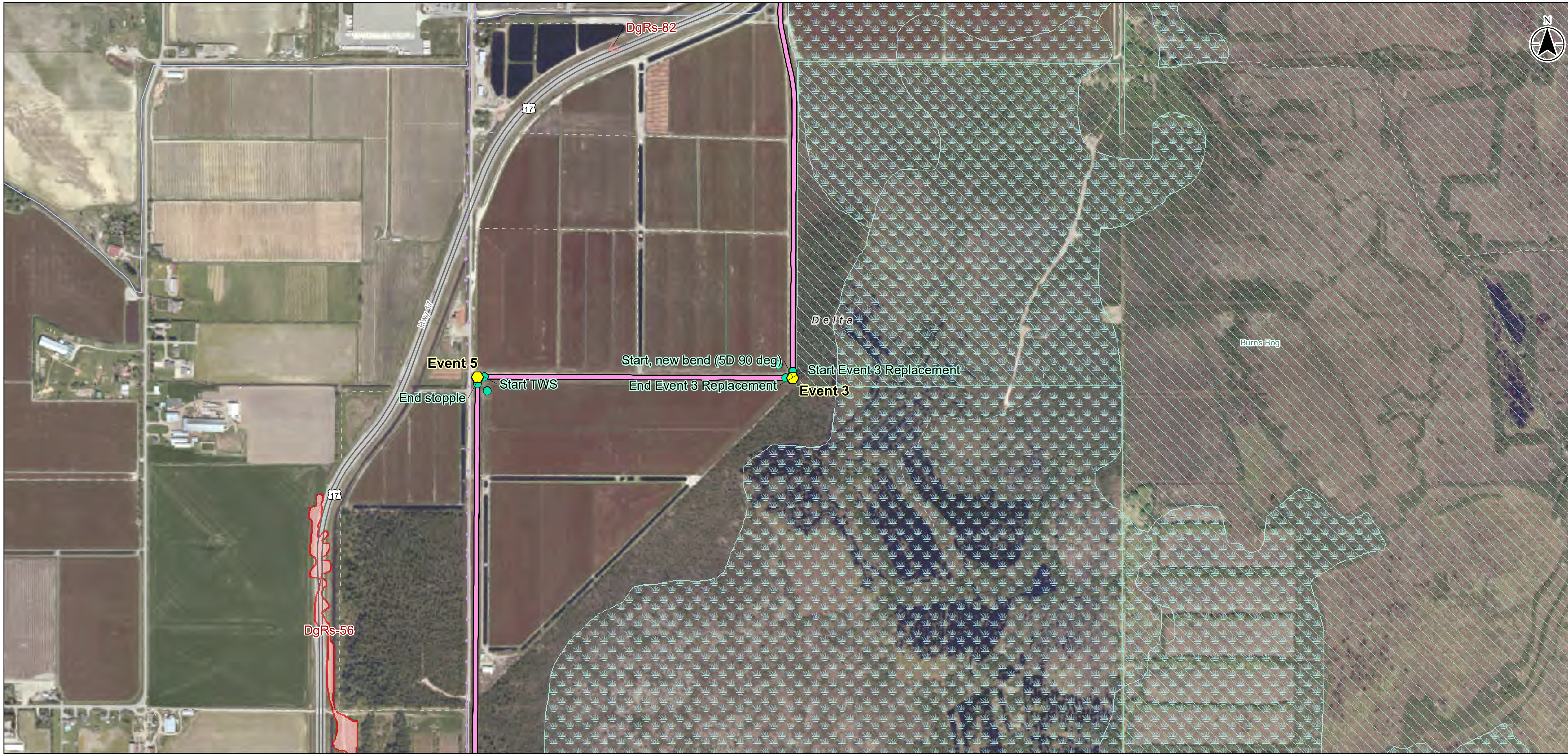
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

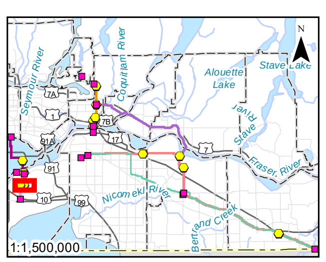
Figure No.
2

Page No.
3 of 17

Title
Midrange Map
Event 1, Tilbury LNG Plant, & Tilbury Regulating Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





Highway
Local Street
Resource Road
Transmission Line
Watercourse
Wetland
Local Greenspace
Municipal Boundary
TIMC Feature
TIMC Event
TIL BEN 323
Archaeological Site - Legacied
Archaeological Site - Previously Recorded

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

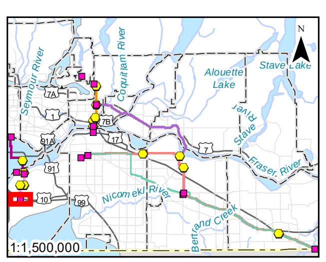
Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 4 of 17

Title
Midrange Map
Event 3 & 5



Highway
Road
Local Street
Resource Road
Trail
Transmission Line
Watercourse
Wetland
Local Greenspace
Municipal Boundary

Facility
TIL BEN 323

Archaeological Site - Legacied
Archaeological Site - Previously Recorded

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

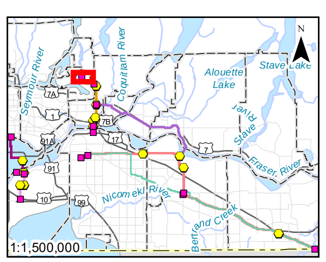
Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 5 of 17

Title
Midrange Map
Benson Regulating Station



Road
Local Street
Resource Road
Trail
Transmission Line
Watercourse
Local Greenspace
Municipal Boundary
Facility

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

Stantec FORTIS BC

Project Location
Lower Mainland, BC

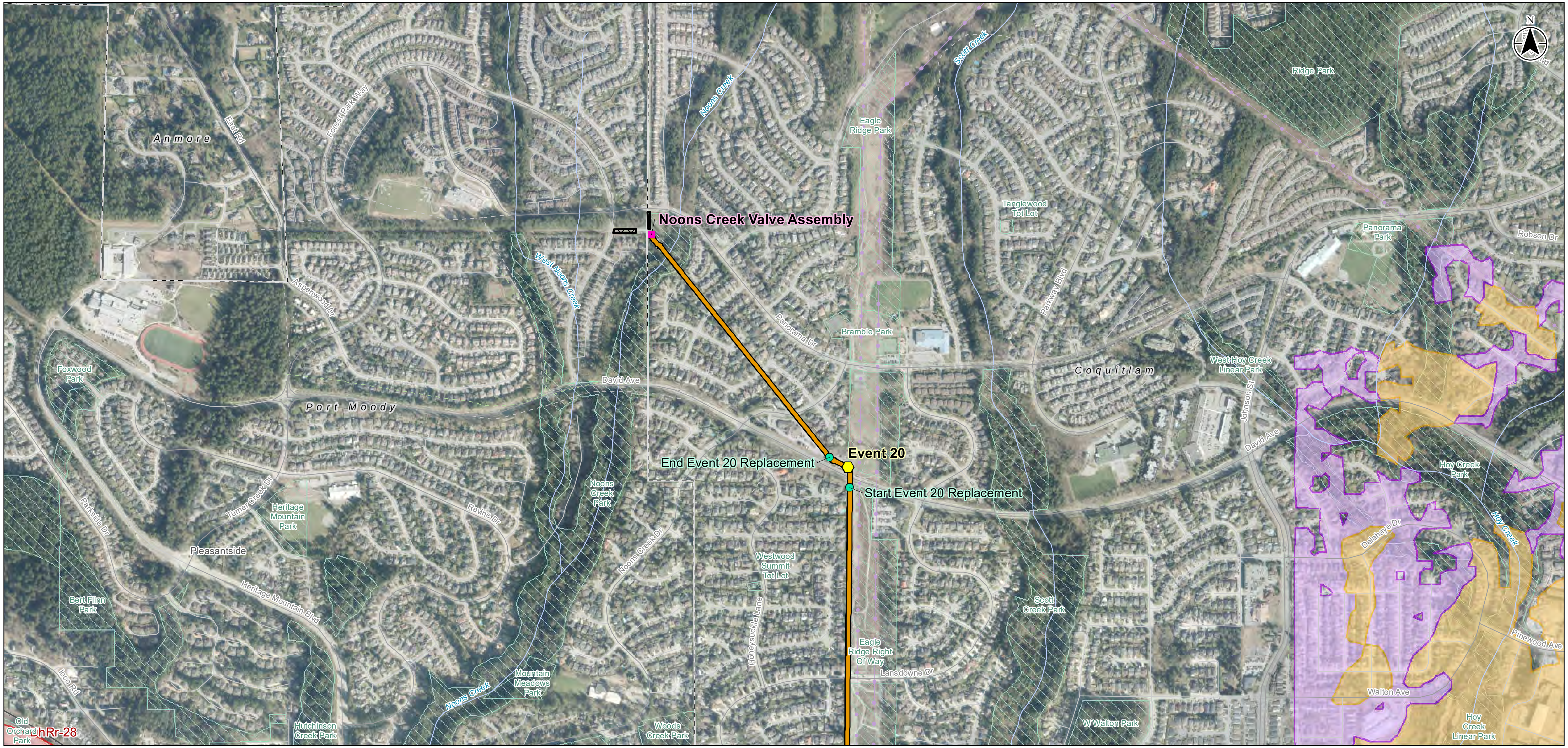
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

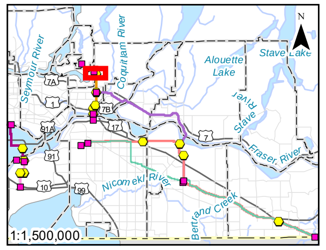
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 6 of 17

Title
Midrange Map
Anmore Regulating Station

\\Ca0183-ppfss01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





- Road
- Local Street
- Resource Road
- Trail
- Trail
- Railway
- Transmission Line
- Watercourse
- Local Greenspace
- Municipal Boundary
- Facility
- TIMC Feature
- TIMC Event
- CPH NOO & NC 508
- Temporary Workspace
- Archaeological Site - Previously Recorded

Archaeological Potential - Chilliwack AOA

- High
- Moderate

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

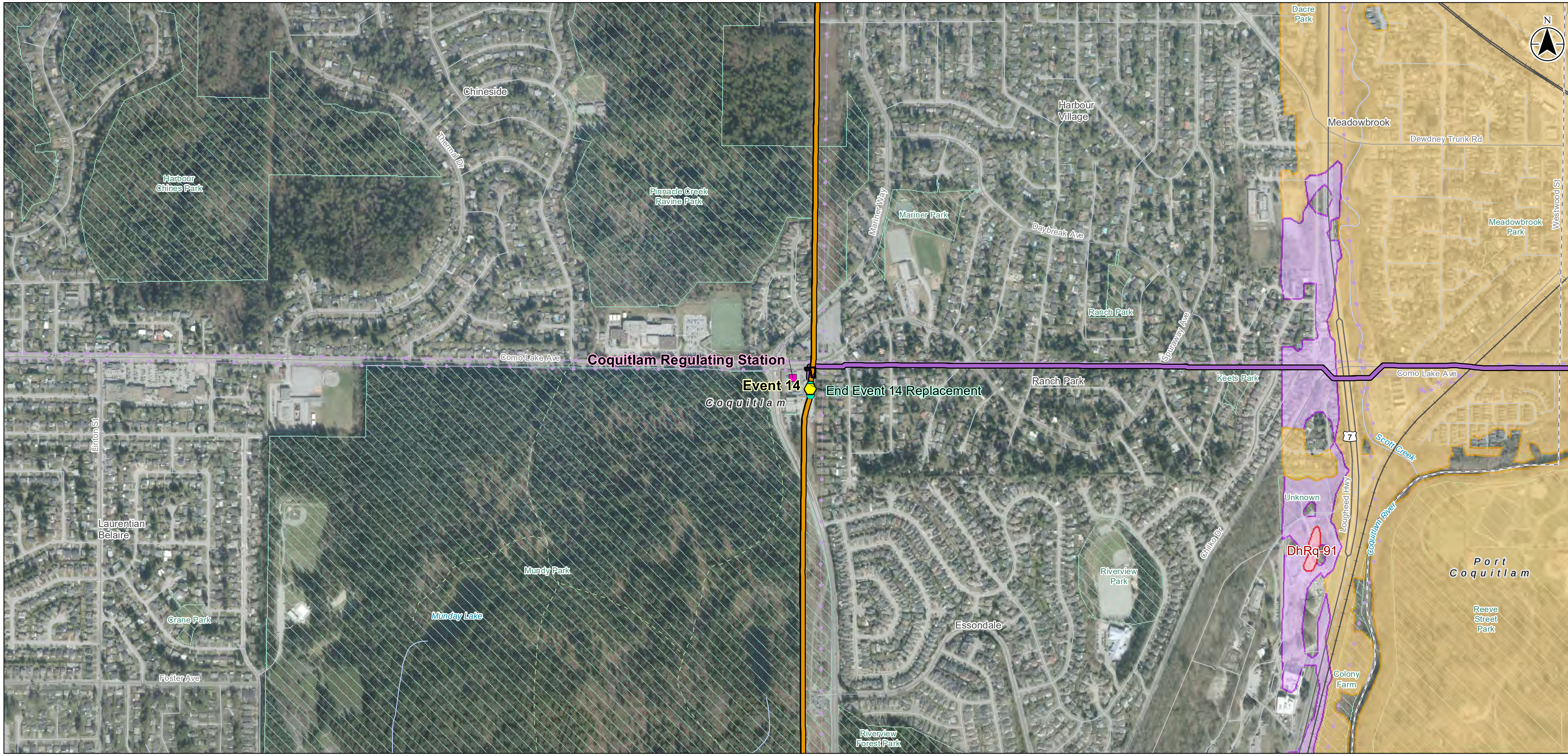
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

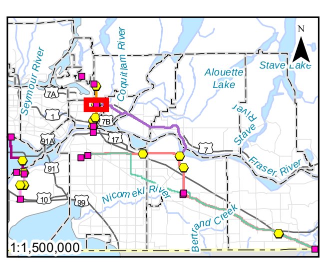
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 7 of 17

Title
Midrange Map
Event 20 & Noons Creek Valve Assembly

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

Highway
Road
Local Street
Resource Road
Trail
Railway
Transmission Line
Watercourse
Local Greenspace
Municipal Boundary
Facility
TIMC Feature
TIMC Event
CPH NOO & NC 508
LIV COQ 323, BH MFL
Temporary Workspace
Archaeological Site - Previously Recorded

Archaeological Potential - Chilliwack AOA

High
Moderate

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

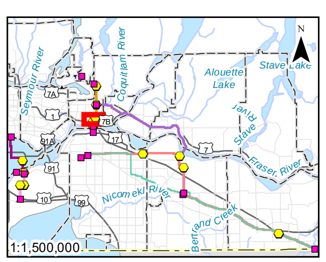
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 8 of 17

Title
Midrange Map
Event 14 & Coquitlam Regulating Station

\\Ca0183-ppfss01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

- Highway
- Road
- Local Street
- Resource Road
- Trail
- Railway
- Transmission Line
- Watercourse
- Local Greenspace
- Municipal Boundary
- First Nations Reserve
- TIMC Feature
- TIMC Event
- CPH NOO & NC 508
- Archaeological Site - Previously Recorded

Archaeological Potential - Chilliwack AOA

- High

0 100 200 300 400 500 m

1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

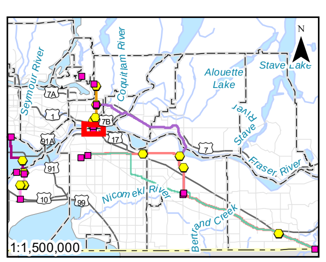
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2 | Page No. 9 of 17

Title
Midrange Map
Event 4, 5, & 9

V:\Ca0183-ppaqf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

- Highway
- Road
- Local Street
- Resource Road
- Railway
- Transmission Line
- Watercourse
- Local Greenspace
- Municipal Boundary
- Facility
- TIMC Feature
- TIMC Event
- CPH NOO & NC 508
- Temporary Workspace
- Archaeological Site - Previously Recorded
- Archaeological Site - Previously Recorded

Archaeological Potential - Chilliwack AOA
- High

0 100 200 300 400 500 m

1:10,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

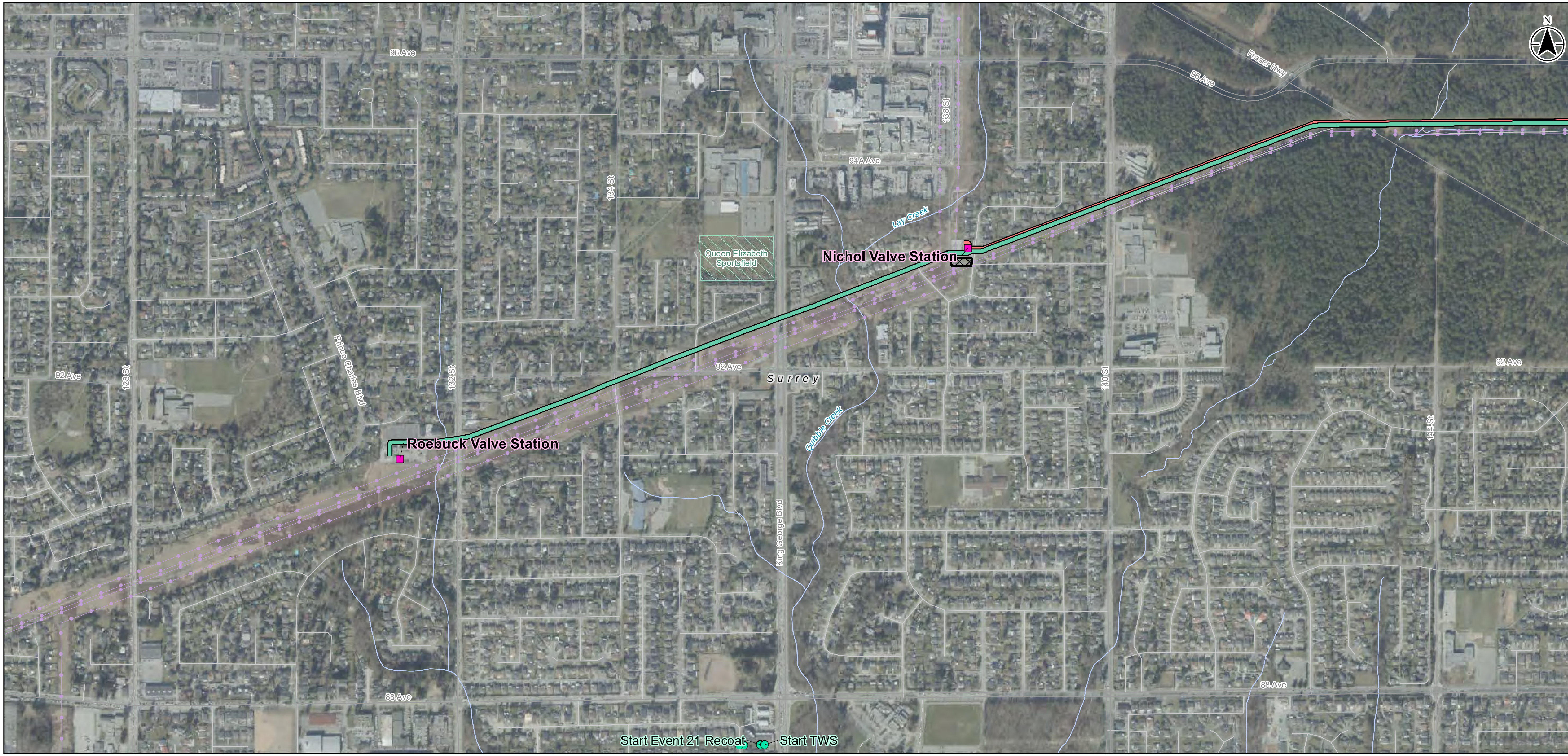
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

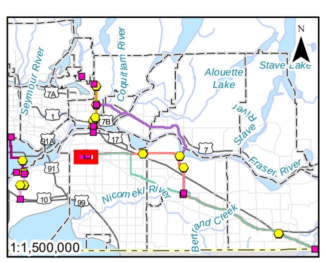
Figure No. 2

Page No. 10 of 17

Title
Midrange Map
Event 1, Cape Horn Regulating Station, & Port Mann Valve Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





Road
Local Street
Resource Road
Transmission Line
Watercourse
Local Greenspace
Municipal Boundary
Facility
TIMC Feature
HUN ROE 1067
HUN NIC 762
Temporary Workspace

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

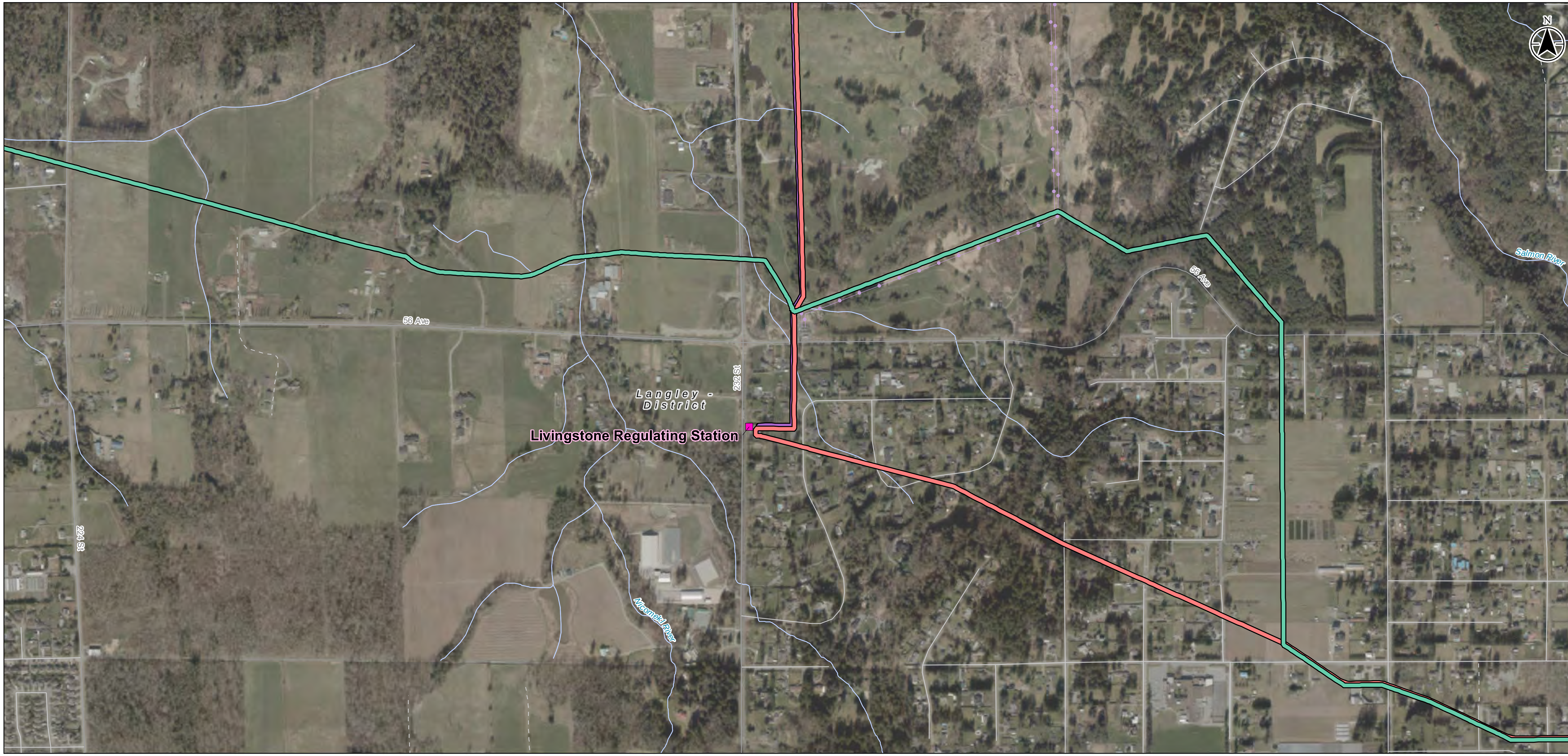
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

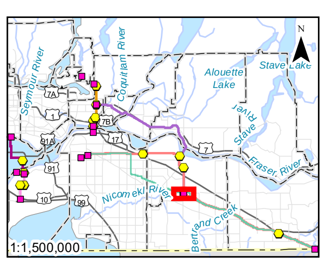
Figure No.
2

Page No.
11 of 17

Title
Midrange Map
Nichol Valve Station, & Roebuck Valve Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





Road
Local Street
Resource Road
Transmission Line
Watercourse
Municipal Boundary
Facility
HUN ROE 1067
HUN NIC 762
LIV COQ 323, BH MFL

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

Stantec FORTIS BC

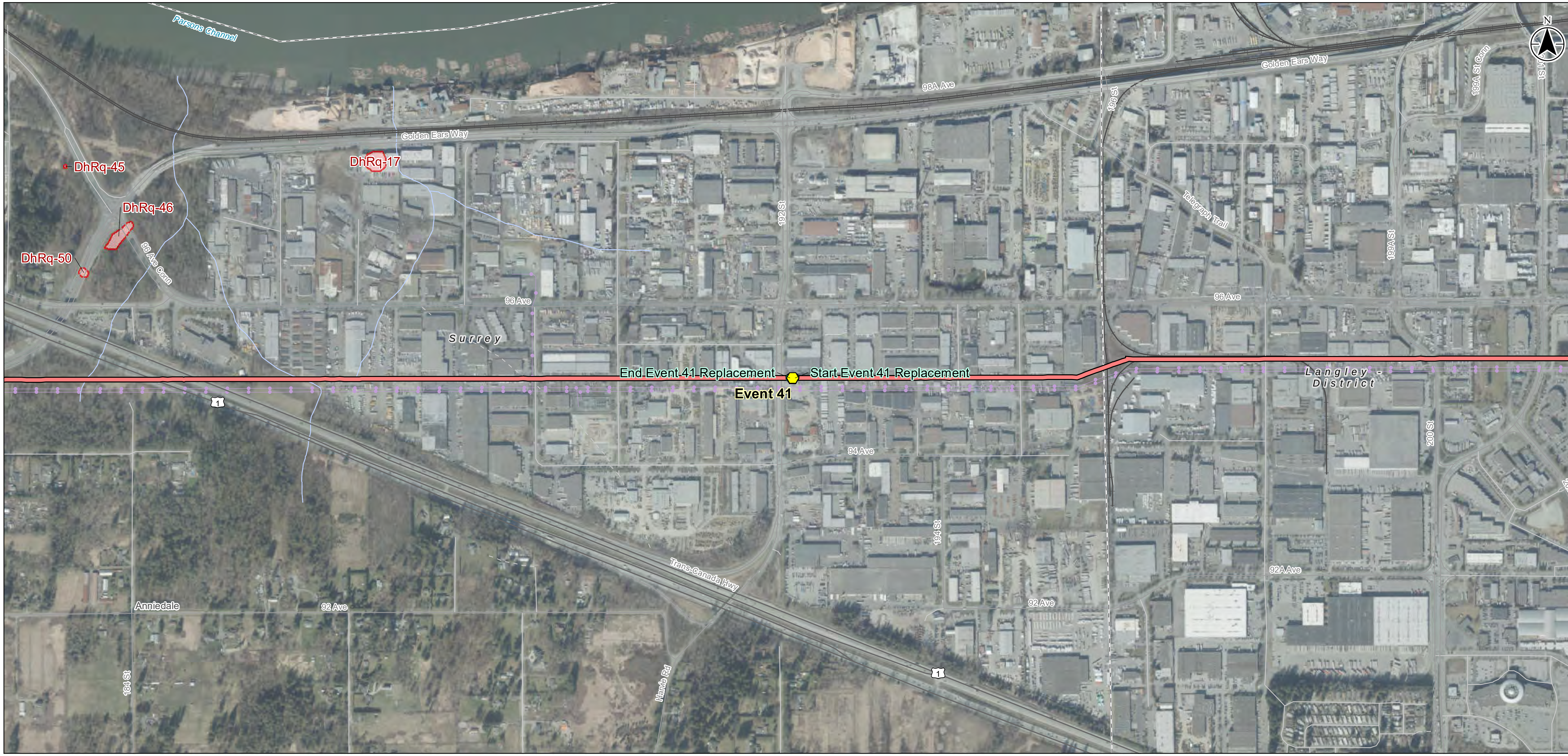
Project Location
Lower Mainland, BC

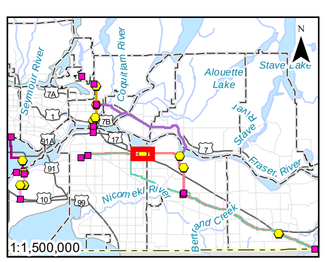
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 12 of 17

Title
Midrange Map
Livingstone Regulating Station





- Highway
- Road
- Local Street
- Resource Road
- Railway
- Transmission Line
- Watercourse
- Municipal Boundary
- TIMC Feature
- TIMC Event
- HUN NIC 762
- Archaeological Site - Previously Recorded

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

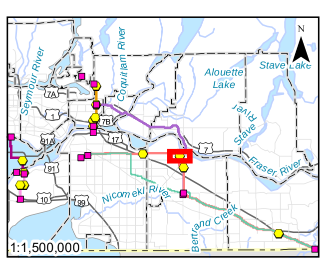
Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 13 of 17

Title
Midrange Map
Event 41



Road	TIMC Feature
Local Street	TIMC Event
Resource Road	HUN NIC 762
Railway	LIV COQ 323, BH MFL
Transmission Line	Archaeological Site - Previously Recorded
Watercourse	
Local Greenspace	
Municipal Boundary	
First Nations Reserve	

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Stantec FORTIS BC

Project Location
Lower Mainland, BC

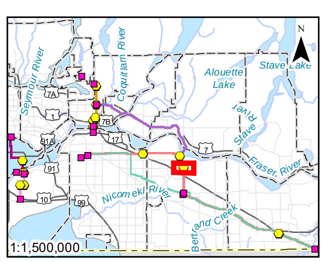
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 14 of 17

Title
Midrange Map
Event 36

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

- Highway
- Road
- Local Street
- Resource Road
- Trail
- Railway
- Transmission Line
- Watercourse
- Municipal Boundary
- TIMC Feature
- TIMC Event
- HUN NIC 762
- LIV COQ 323, BH MFL
- Archaeological Site - Previously Recorded

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

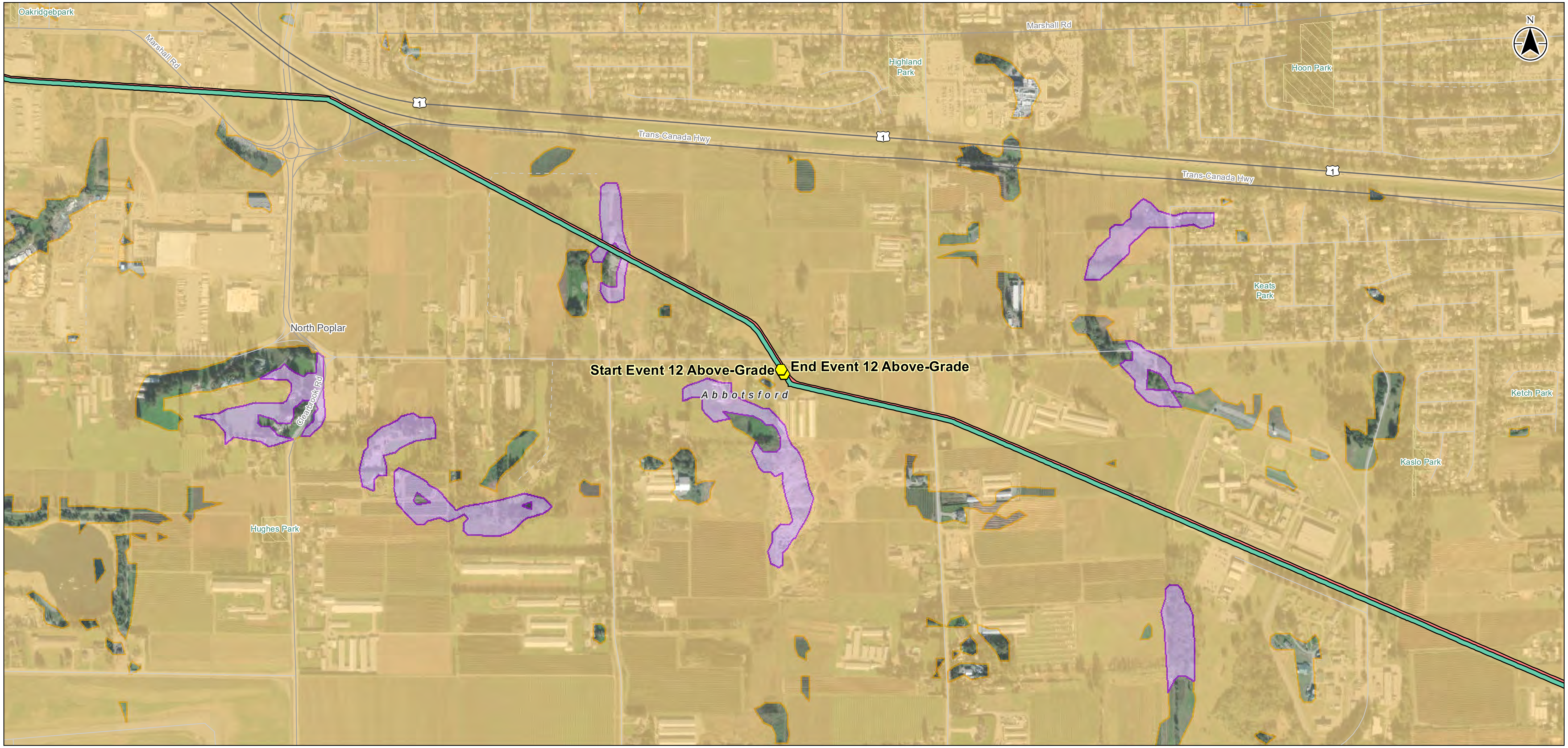
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

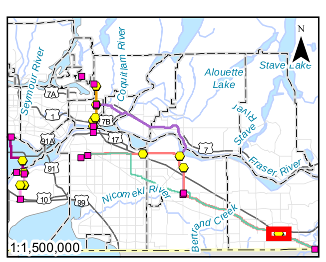
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 15 of 17

Title
Midrange Map
Event 9

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmelliship





Highway
Road
Local Street
Resource Road
Local Greenspace
Municipal Boundary

TIMC Event
HUN ROE 1067
HUN NIC 762

Archaeological Potential - Chilliwack AOA

High
Moderate

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

0 100 200 300 400 500 m
1:10,000 (at original document size of 11x17)

Project Location
Lower Mainland, BC

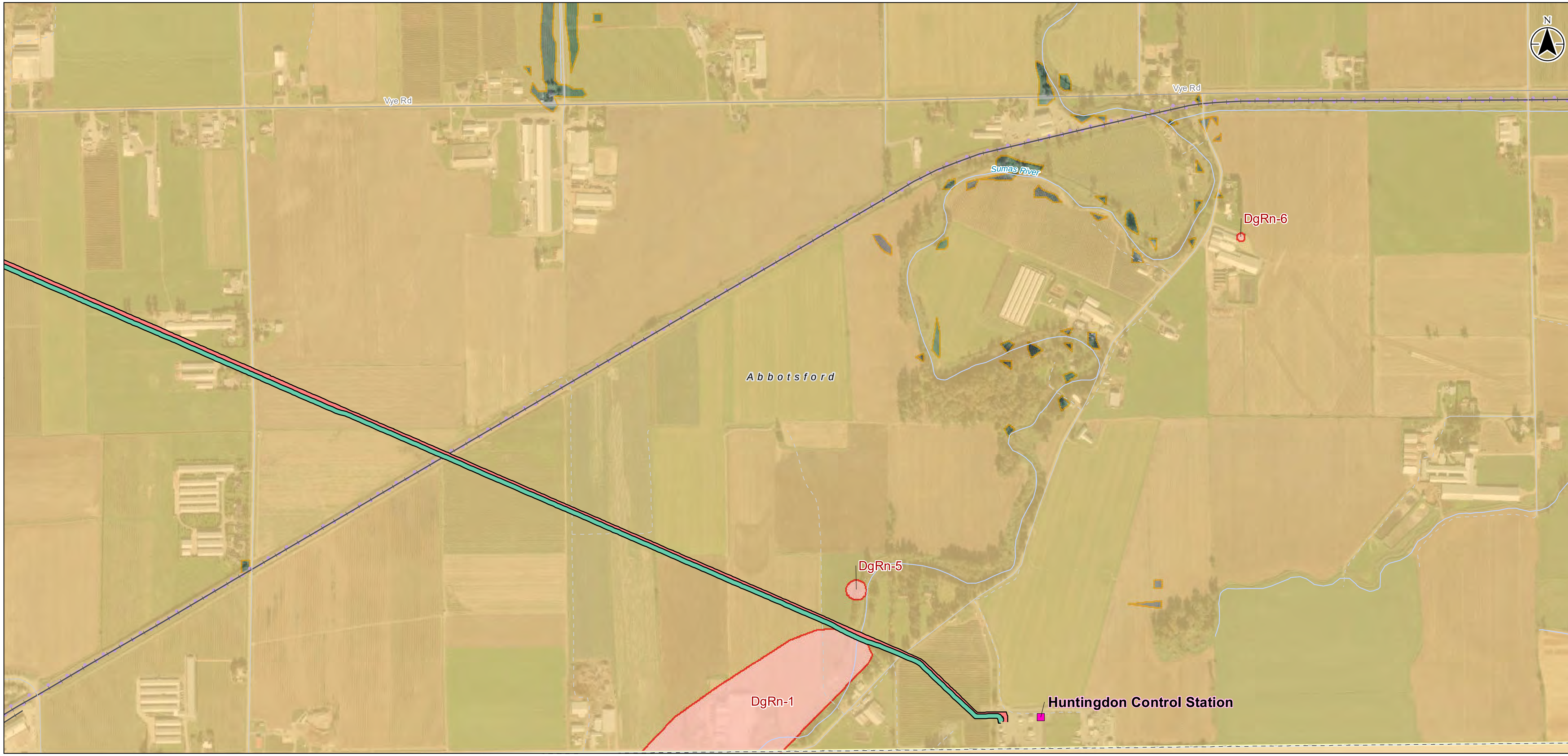
Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

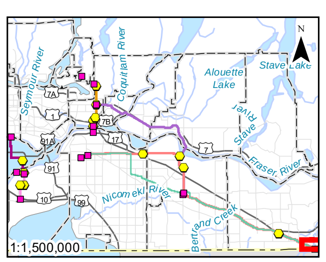
Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 16 of 17

Title
Midrange Map
Event 12

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship





- International Boundary
- Road
- Local Street
- Resource Road
- Railway
- Transmission Line
- Watercourse
- Municipal Boundary
- Facility
- HUN ROE 1067
- HUN NIC 762
- Archaeological Site - Previously Recorded

Archaeological Potential - Chilliwack AOA

- High

0 100 200 300 400 500 m

1:10,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Archaeological Model: Chilliwack AOA
4. Imagery: ESRI World Imagery

Project Location
Lower Mainland, BC

Project Number: 110904209
Prepared by CMELLISHIP on 20200821
Requested by SMCKNIGHT on 20200915
Checked by TCARDINAL on 20201007

Client/Project/Report
Fortis BC
CTS TIMC Project
Archaeological Review

Figure No. 2
Page No. 17 of 17

Title
Midrange Map
Huntingdon Control Station

\\Ca0183-pbagf01\workgroup\1232\projects\110904209\figures\reports\TIMC_Archaeological_Review\fig_110904209_TIMC_002_midrange.mxd Revised: 2020-11-02 By: cmellship

Appendix J

CONSULTATION AND ENGAGEMENT

Appendix J-1

CONSULTATION AND ENGAGEMENT PLAN

Transmission Integrity Management Capabilities
Consultation and Engagement Plan

Introduction

This document outlines FortisBC's (FEI) Consultation and Engagement Plan for the Transmission Integrity Management Capabilities (TIMC) project. With respect to the regulatory submission, the Project is referred to as TIMC; however, for clarity in its external communications, consultation, and engagement, FEI is referring to the Project as Transmission System Upgrades (TSU).

The purpose of the Consultation and Engagement Plan is to ensure that local Indigenous groups and stakeholders are informed about the Project, have access to Project information, and have opportunities to ask questions and provide feedback.

The following consultation and engagement plan is organized as follows:

- Project Overview
- COVID-19 Considerations
- Public Consultation
    - Consultation Objectives
    - Stakeholders
    - Sequence of Consultation Activities
- Indigenous Engagement
    - Engagement Objectives
    - Indigenous groups
    - Sequence of Engagement Activities

Project Overview

TIMC is an integrity-driven project to ensure the safety and reliability of FEI's transmission pressure gas lines. FEI has identified issues relating to crack-like imperfections and potential hazards on the seven pipelines that comprise its Lower Mainland system known as the CTS. The Project will include upgrades to a number of gas lines and facilities across the Lower Mainland. These upgrades will accommodate new electro-magnetic in-line inspection technology (EMAT). This technology will detect any further issues and help maintain the integrity of the system.

Stantec Consulting conducted an analysis which indicated the need for work at 24 locations.[1] This work includes replacing or recoating 13 sections of gas line ranging in size from about 30 to 200 meters on existing rights of way, and making modifications at 13 facilities to allow facilities to accommodate the EMAT tool. Once work is complete, FEI will run the EMAT tool through its CTS system allowing it to detect any further defects.

[1] TIMC's regulatory submission specifies that 26 work events are proposed on a facility or gas line; 13 events are planned on FEI's facilities and 13 events are planned on gas lines. Public-facing messaging in this Consultation and Engagement Plan has been simplified to indicate that both the facility and gas line work will occur at 24 separate geographical locations. This approach takes into account work locations where more than one work event is planned.

Work is expected to take place across nine municipalities in the Lower Mainland on existing rights of way and within FEI premises.

COVID-19 Considerations

As with many other critical service providers, FEI has adapted to the challenges of COVID-19. This means continuing to advance critical projects, including TIMC, to meet the energy needs of customers and communities.

FEI has adapted its approach to consultation and engagement to respect the guidance of public health authorities. For example, rather than in-person meetings FEI consulted and engaged with interested parties via telephone, email and virtual presentations. Various communications tactics were adopted to support these activities, including proactively developing a project webpage, creating a dedicated project phone number and email address, and introducing the project to customers through a bill insert.

Public Consultation

Consultation Objectives

FEI identified a number of objectives that set the framework for public consultation for the Project including:

- Ensure balanced and objective information is provided to all affected and interested stakeholders;
- Communicate the benefits of the Project (e.g. reliability and integrity of FEI's system), and potential positive socio-economic impacts to communities during construction;
- Provide opportunities for stakeholders to give feedback and to understand their concerns through an ongoing dialogue; and
- Consider, and where possible, incorporate stakeholder feedback

Stakeholders

FEI identified the following stakeholders:

Key Stakeholders	
Municipalities: • City of Abbotsford • City of Coquitlam • City of Delta • City of Port Moody • City of Richmond • City of Surrey • City of Vancouver • Township of Langley • Village of Anmore	**Public:** • Residents and businesses along the rights of way • Residents and businesses nearby the rights of way and worksites • FEI's natural gas customers

Sequence of Consultation Activities

The following table outlines the sequence of consultation activities:

Activities
Pre-CPCN filing **Consultation starting October 2020**

• Consult with municipalities in support of the BCUC application
  • Email Project information letters
  • Follow up with emails, phone calls and virtual presentations

• Support FEI's Property Services branch in consulting with residents and businesses along the rights of way
  • Mail Project information letters to businesses and residents along the rights of way
  • Follow up with phone calls and emails

• Consult with residents and businesses nerby the rights of way and worksites
  • Distribute Project information letters
  • Respond to questions

• Public outreach in support of the BCUC application
  • Create a dedicated web page with Project details
  • Set up a Project specific phone number and email address
  • Monitor and respond to inquiries

• Develop a plan to ensure local stakeholder socio-economic benefits are being maximized, and risks mitigated; tracking and reporting means to be developed
Post CPCN Filing **Proposed Construction 2022-2024**
• Customer rate impact awareness as part of BCUC application (bill insert early 2021)
• Create and maintain pre-CPCN filing communication material (e.g. webpage and information cards) to support construction
• FEI to review engineering drawings with Municipal staff
• Stakeholder and Municipal notifications ahead of construction
• Outreach to affected communities ahead of construction to raise project awareness and respond to inquiries in advance of, and throughout construction
• Ongoing contractor/project team support to ensure positive customer and community interactions
• General outreach to thank communities where work has been completed

Indigenous Engagement

Engagement Objectives

FEI identified a number of objectives that set the framework for engagement with Indigenous groups including:

- Ensure balanced and objective information is provided to all affected and interested Indigenous groups
- Engage meaningfully with Indigenous groups through transparent, frequent dialogue
- Identify issues, concerns, and shared interests early on and focus engagement on mutually agreeable solutions
- Be a leader in the development of strong, mutually beneficial relationships with Indigenous groups

- Build and nurture effective relationships with Indigenous groups across the province, while ensuring that FEI has the structure, resources and skills necessary to maintain these relationships
- Be informed by FEI's Statement of Indigenous Principles and ensure these principles will continue to guide FEI throughout the lifecycle of this Project

Indigenous Groups

FEI identified the following Indigenous groups with asserted interests in the project as per the BC Government Consultative Areas Database (CAD) Spatial Overview Engine (SOE) Report.

Indigenous groups	
• Cowichan Tribes	• Seabird Island Band
• Halalt First Nation	• Semiahmoo First Nation
• Katzie first Nation	• Shxw'ow'hamel First Nation
• Kwantlen First Nation	• Skawahlook First Nation (via PRRO)
• Kwikwetlem First Nation	• Soowahlie First Nation (via PRRO)
• Lake Cowichan First Nation	• Squamish Nation
• Leq'á:mel First Nation	• Stó:l? Tribal Council (via PRRO)
• Lyackson First Nation	• Stó:l? Nation (via PRRO)
• Matsqui First Nation	• Sumas First Nation (via PRRO)
• Musqueam Indian Band	• Stz'uminus First Nation
• Penelakut Tribe	• Tsawwassen First Nation
• People of the River Referrals Office (PRRO)	• Tseil-Waututh Nation
• Peters First Nation	

Sequence of Engagement Activities

The following table outlines the sequence of Indigenous engagement activities.

Activities
Pre-CPCN filing **Engagement starting October 2020**
• Initiate Indigenous engagement in support of the BCUC application • Initial email and letter (digital) to introduce the project, including mapping • Follow up through phone calls and email, or existing touchpoints with communities • Virtual meetings with Indigenous groups upon request

• Share project information with Indigenous groups
  ◦ Follow up email and letter (digital) with preliminary environmental and archaeological information/reports
  ◦ Virtual meetings with Indigenous groups on request

Post CPCN filing **Proposed construction 2022-2024**
• Ongoing engagement with Indigenous communities to ensure that potential effects on their interests are mitigated, and collaborative, transparent dialogue continues

• Support FEI contractors to ensure they are upholding FEI’s standards of Indigenous Engagement
• Implementation of measures to ensure Indigenous and other local socio-economic benefits are being maximized, and risks mitigated; tracking and reporting ongoing
• Support the inclusion, and track Indigenous and other local businesses and workers to work on the TSU project
• Develop capacity funding agreements to support the involvement of interested Indigenous groups
• Develop a plan to ensure Indigenous socio-economic benefits are being maximized, and risks mitigated; tracking and reporting means to be developed
• Support the inclusion, and track Indigenous and other local businesses and workers to work on the TSU project
• Develop capacity funding agreements to support the involvement of interested Indigenous groups
• Develop a plan to ensure Indigenous socio-economic benefits are being maximized, and risks mitigated; tracking and reporting means to be developed

Appendix J-2

STAKEHOLDER CONSULTATION LOG

TIMC Consultation Log

Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
1-Oct-20	Emailed Project Information Letter	Scott Neuman, Engineering, City of Surrey	Joanne Hunton-Sehdev, External Relations	City of Surrey	Sent Project information letter. City of Surrey responded to the letter, directing FEI to another individual who manages third party utility permits. City of Surrey requested engineering drawings, and FEI committed to providing them when available.
1-Oct-20	Emailed Project Information Letter	Chad Braley, Engineering, City of City of Coquitlam	Joanne Hunton-Sehdev, External Relations	City of Coquitlam	Sent Project information letter. City of Coquitlam responded that they will be in touch if they have questions. None raised.
1-Oct-20	Emailed Project Information Letter	Rob Isaac, Engineering, City of Abbotsford	Joanne Hunton-Sehdev, External Relations	City of Abbotsford	Sent Project information letter.
1-Oct-20	Emailed Project Information Letter	Roeland Zwaag, Engineering, Township of Langley	Joanne Hunton-Sehdev, External Relations	Township of Langley	Sent Project information letter.
1-Oct-20	Emailed Project Information Letter	Steven Lan, Engineering, City of Delta	Joanne Hunton-Sehdev, External Relations	City of Delta	Sent Project information letter. City of Delta responded and requested follow-up meeting where FEI provides an overview of potential impacts.
1-Oct-20	Emailed Project Information Letter	Milton Chan, Engineering, City of Richmond	Joanne Hunton-Sehdev, External Relations	City of Richmond	Sent Project information letter.
1-Oct-20	Emailed Project Information Letter	Hamad Quazi, Engineering, City of Vancouver	Joanne Hunton-Sehdev, External Relations	City of Vancouver	Sent Project information letter. City of Vancouver responded asking if this was part of the 2021 gas line upgrade work on East Kent Avenue. City of Vancouver had no concerns.
6-Oct-20	Emailed Project Information Letter	Jeff Moi & Philip Chow, Engineering, City of Port Moody	Joanne Hunton-Sehdev, External Relations	City of Port Moody	Sent Project information letter. The City of Port Moody responded on Oct 24, requesting technical information and scope of work relating to the City of Port Moody. FEI responded that detailed engineering drawings and scope will be shared mid-late 2022. FEI will keep the City of Port Moody informed of progress including schedule and any potential disturbances such as noise impacts to the local community.
6-Oct-20	Emailed Project Information Letter	Juli Halliwell CAO/CFO, Village of Anmore	Joanne Hunton-Sehdev, External Relations	Village of Anmore	Sent Project information letter.
20-Oct-20	Project information letters	Neighboring residents, Fort Langley Station facility, Township of Langley	Kim Halowski & Joanne Hunton-Sehdev, External Relations	Township of Langley, Residents	10 Project information letters distributed by hand to those within close proximity of the FEI facility.
20-Oct-20	Project information letters	Neighboring residents, Livingston Station facility, Township of Langley	Kim Halowski & Joanne Hunton-Sehdev, External Relations	Township of Langley, Residents	30 Project information letters distributed by hand to those within close proximity of the FEI facility.
20-Oct-20	Mailed Project information letter	Neighbouring businesses close to worksites	Joanne Hunton-Sehdev, External Relations	City of Surrey, City of Delta, City of Richmond, Business	Project information letter mailed to 20 businesses.
21-Oct-20	Emailed Project Information Letter	Steve Neilson, Costco Warehouse, 65 Ave.	Joanne Hunton-Sehdev, External Relations	Township of Langley, Business Manager	Sent Project information letter. Stakeholder responded requesting more information.
21-Oct-20	Mailed Project information letter	Pastor Cote, Cornerstone Seventh-Day Adventist Church, Panorama Drive (next to David Ave.)	Joanne Hunton-Sehdev, External Relations	City of Coquitlam, Seventh-Day Adventist Church	Sent Project information letter.
21-Oct-20	Emailed Project Information Letter	Jenette Chen, Dwell Property Management	Joanne Hunton-Sehdev, External Relations	City of Vancouver, Property Management Company	Sent Project information letter via email to Property Management company for distribution to 60 residents of Lighthouse Terrance Strata, East Kent Ave. Vancouver.
21-Oct-20	Mailed Project information letter	Sunny Chohan, Chohan Capital Inc. 15760 110 Avenue, Surrey, BC V4N 4Z1	Colleen Bohun, Property Services	City of Coquitlam, Property Owner	Project information letter mailed to business at 88 Golden Dr, City of Coquitlam BC to introduce the Project.
21-Oct-20	Mailed Project information letter	0998967 BC Ltd. 80 Golden Dr. City of Coquitlam BC V3K 6T1	Colleen Bohun, Property Services	City of Coquitlam, Property Owner	Project information letter mailed to 84 Golden Dr, City of Coquitlam BC to introduce the Project.
21-Oct-20	Mailed Project information letter	Crescent View Apts Ltd C/O Cressey Dev Corp #200-555 8th Ave W Vancouver	Colleen Bohun, Property Services	City of Coquitlam, Property Management Company	Project information letter mailed to Property Owner as the Project impacts residents at 2665 Cape Horn Ave, City of Coquitlam BC.
21-Oct-20	Mailed Project information letter	Bruce May, Owner, Cranwest Farms Corp. Inc No. BC1262551	Colleen Bohun, Property Services	City of Delta, Business Owner	Project information letter mailed to impacted landowner at 6770 72 St, Delta BC.
21-Oct-20	Mailed Project information letter	Husky Gas Station, c/o Saffal Investments Inc 1672 W 6 Ave	Colleen Bohun, Property Services	City of Delta, Business Owner	Project information letter mailed to impacted landowner, where FEI requires access through private property.
21-Oct-20	Mailed Project information letter	Nicholas Kleider 8036 232 Street Langley BC V1M 3R8	Colleen Bohun, Property Services	Township of Langley, Business Owner	Project information letter mailed to impacted landowner, where FEI requires access through private property.
21-Oct-20	Mailed Project information letter	Kenneth Charles Blankstein 301-6351 197th Street, Langley BC V2Y 1X8	Colleen Bohun, Property Services	Township of Langley, Business Owner	Project information letter mailed to impacted landowner, where FEI requires access through private property.
22-Oct-20	Phone call	Jeannie Willson, Engineering Liaison City of Coquitlam	Joanne Hunton-Sehdev, External Relations	City of Coquitlam	City of Coquitlam staff noted no concerns at this time, and requested a follow-up meeting in 2021 to review schedule and its interaction with other major construction Projects planned in the City over the next 3-4 years.
23-Oct-20	Mailed Project information letter	Landowner, Blue Acre Farms, 1357 Gladwin Road, Abbotsford	Colleen Bohun, Property Services	City of Abbotsford, Business Owner	Project information letter mailed to impacted landowner, where FEI requires access through private property.
26-Oct-20	Email	Juli Halliwell CAO/CFO, Village of Anmore	Joanne Hunton-Sehdev, External Relations	Village of Anmore	Sent follow-up email asking if the Village of Anmore had any more questions ahead of filing. On Oct 27, the Village of Anmore responded requesting meeting for FEI to provide Project overview.

TIMC Consultation Log

Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
28-Oct-20	Virtual Meeting	Evan Chrystal, Terry Chan, City of Delta	Kim Halowski & Joanne Hunton-Sehdev, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director	City of Delta	City of Delta requested engineering drawings as the Project progresses, a designated FEI point of contact, a record that landowners have been notified, and a check of permitting requirements. Overall no concerns raised.
29-Oct-20	Virtual Meeting	Juli Halliwell CAO/CFO, Village of Anmore	Kim Halowski & Joanne Hunton-Sehdev, External Relations	Village of Anmore	Met with CEO of Village of Anmore. No concerns raised; requested a map highlighting FEI pipelines within their jurisdiction.
30-Oct-20	Project information letters	Neighbouring residents close to work site on right of way at Cape Horn	Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Coquitlam, Residents	Project information letter delivered by hand to 10 residents within close proximity of work within right of way at Cape Horn.
30-Oct-20	Email	Sam Lau, Land Manager, City of Surrey	Joanne Hunton-Sehdev, External Relations	City of Surrey	Sent follow up email to the City of Surrey with an update of the Project scope. No concerns raised.
30-Oct-20	Email	Roeland Zwaag, Engineering, Township of Langley	Joanne Hunton-Sehdev, External Relations	Township of Langley	Sent follow up email to the Township of Langley with an update of the Project scope. No concerns raised.
30-Oct-20	Email	Steve Neilson, Costco Warehouse, 65 Ave., Langley BC	Joanne Hunton-Sehdev, External Relations	Township of Langley, Business Manager	Sent follow-up email with Project update information. No concerns raised.
30-Oct-20	Phone call	Sunny Chohan, Chohan Capital Inc. 15760 110 Avenue, Surrey, BC V4N 4Z1	Cristina Vieira, Property Services	City of Coquitlam, Property Owner	Follow-up phone call. Resident requested the notification letter be resent via email.
30-Oct-20	Email	Mr. Song, 0998967 BC Ltd. 80 Golden Dr. City of Coquitlam BC V3K 6T1	Cristina Vieira, Property Services	City of Coquitlam, Property Owner	Follow-up phone call. Mr. Song will forward to the owners.
30-Oct-20	Email	Tom Johnson, Crescent View Apts Ltd C/O Cressey Dev Corp #200-555 8th Ave W Vancouver	Cristina Vieira, Property Services	City of Coquitlam Properties, 2665 Cape Horn Ave, Coquitlam	Follow-up email. Responded with a request to email another copy of the Project information letter.
30-Oct-20	Voicemail	Bruce May, Owner, Cranwest Farms Corp. Inc No. BC1262551	Cristina Vieira, Property Services	City of Delta, Business Owner	Left voicemail following up and confirming the Project Information letter was received.
30-Oct-20	Phone call	Husky Gas Station, c/o Saffal Investments Inc 1672 W 6 Ave	Cristina Vieira, Property Services	City of Delta, Business Owner	Follow-up call. Husky Gas Station received the Project information letter and is forwarding to property owner today.
30-Oct-20	Phone call	Nicholas Kleider 8036 232 Street Langley BC V1M 3R8	Cristina Vieira, Property Services	Township of Langley, Business Owner	Follow-up phone call to property owner who is aware of the Project and will advise if they have further questions.
30-Oct-20	Phone call	Kenneth Charles Blankstein 301-6351 197th Street, Langley BC V2Y 1X8	Cristina Vieira, Property Services	Township of Langley, Business Owner	Property owner did not receive the mailed copy of the Project information letter. FEI emailed directly to property owner.
30-Oct-20	Email	Sukhdev Seikhon, 32744 King Rd Abbotsford BC	Cristina Vieira, Property Services	City of Abbotsford, Business Owner	Project information letter mailed to impacted landowner, where FEI requires access through private property.
30-Oct-20	Project information letters	Neighbouring residents close to work planned at the Noons Creek facility	Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Port Moody, Residents	Project information letter delivered to 20 residents within close proximity of FEI facility.
30-Oct-20	Project information letters	Neighbouring residents close to work planned at City of Coquitlam Gate Station facility	Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Coquitlam, Residents	Project information letter delivered to 60 residents within close proximity of FEI facility.
30-Oct-20	Project information letters	Neighbouring residents close to work planned on right of way and facility on David Ave	Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Coquitlam, Residents	Project information letter delivered to 20 residents within close proximity of FEI facility.
30-Oct-20	Project information letters	Neighbouring residents close to work planned at the Nichol and Roebuck facilities	Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Surrey, Residents	Project information letter delivered to 40 residents within close proximity of FEI facility.
2-Nov-20	Email	Rob Isaac, Engineering, City of Abbotsford	Joanne Hunton-Sehdev, External Relations	City of Abbotsford	Sent follow-up email asking if the City of Abbotsford had any more questions ahead of filing. No concerns raised.
2-Nov-20	Email	Milton Chan, Engineering, City of Richmond	Joanne Hunton-Sehdev, External Relations	City of Richmond	Sent follow-up email asking if the City of Richmond had any questions ahead of CPCN filing. City of Richmond responded and requested a meeting on Nov 12 for FEI to provide Project overview.
2-Nov-20	Phone call to FEI Helpline	Neighbouring residents close to Coquitlam Gate Station facility	Joanne Hunton-Sehdev, External Relations	City of Coquitlam, Resident	Resident called regarding ongoing construction impacts in the neighbourhood and concerns about noise. FEI acknowledged awareness of recent impacts and reiterated a commitment to consult with residents and address concerns prior to construction. Notifications will be provided ahead of construction.
3-Nov-20	Email	Chad Braley & Jeannie Willson, Engineering, City of Coquitlam	Joanne Hunton-Sehdev, External Relations	City of Coquitlam	Sent follow-up email asking if the City of Coquitlam had any questions ahead of CPCN filing. City of Coquitlam responded on Nov 10 and stated they don't have any questions at this time and would like to meet with FEI once preliminary drawings are available.
3-Nov-20	Email	Evan Chrystal, City of Delta	Joanne Hunton-Sehdev, External Relations	City of Delta	City of Delta provided supplementary specifications and drawings, and Burns Bog Specialist contact information.
5-Nov-20	Phone call to FEI Helpline	Neighbouring resident close to Noons Creek, Port Moody	Joanne Hunton-Sehdev, External Relations	City of Port Moody, Resident	Resident called and enquired if a new gas line was being constructed in the area. FEI informed them the work is within FEI's facility and doesn't include a new gas line in the area. FEI will update residents as the Project progresses. The resident was grateful for FEI's response and had no further concerns.
12-Nov-20	Virtual Meeting	Beata Ng, Eric Sparolin, City of Richmond	Atif Gahni, Senior Pipeline Engineer, Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Richmond	City of Richmond noted no concerns and requested that FEI continue dialogue with Project progress updates.
13-Nov-20	Email	Beata Ng, Eric Sparolin, City of Richmond	Atif Gahni, Senior Pipeline Engineer, Kim Halowski & Joanne Hunton-Sehdev, External Relations	City of Richmond	FEI emailed a recap of the Nov 12, meeting reiterating locations of FEI work sites, commitment to ongoing consultation, and links to the Project webpage.

TIMC Consultation Log

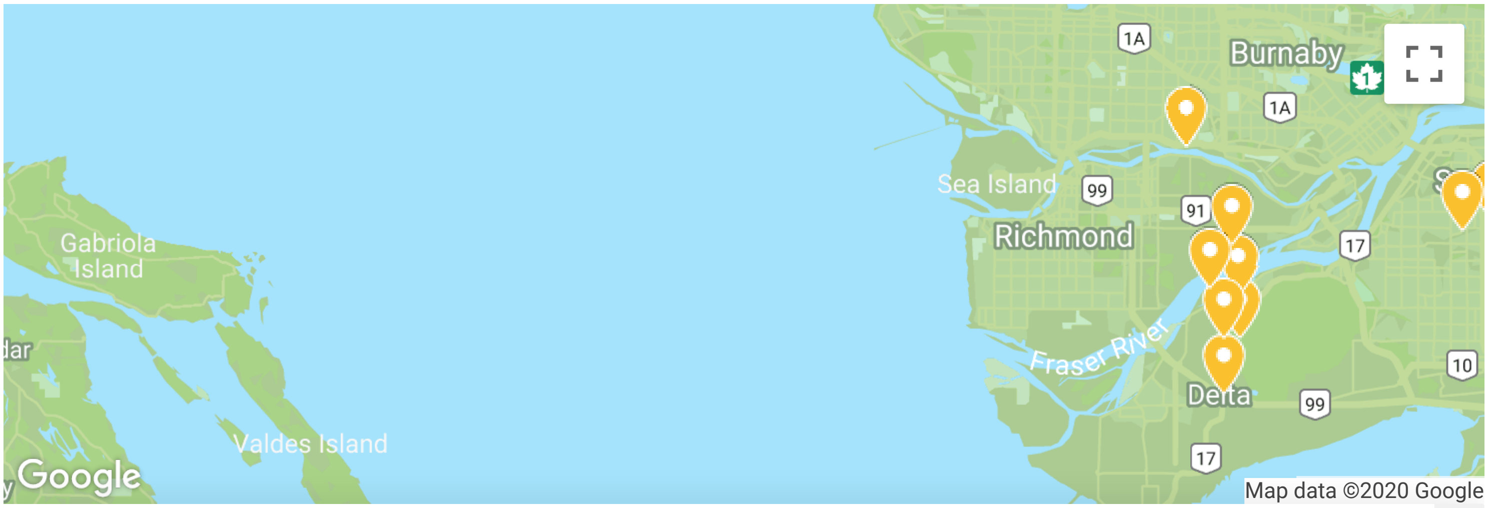
Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
2-Dec-20	Virtual Meeting	Trans Mountain: Varga Marton, Manbir Bhullar, Permitting Technicians	Ly-Shu Ramos, Project Permit Manager, Joanne Hunton-Sehdev, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director, Zack Barton Project Manager, Danielle Samels Permit Coordinator	Third Party Stakeholder	FEI provided a project overview and included details explaining where FEI's work is within close proximity to the existing Trans Mountain Pipeline. Trans Mountain identified three locations where planned expansion work will take place close to FEIs planned work. Dialogue will continue between FEI and Trans Mountain permitting and pipeline inspectors.
15-Dec-20	Virtual Meeting	Ministry of Transportation and Infrastructure (MOTI): Roanna Cruz, Maziar Kazemi, Rupinder Prihar, Tyler Gaudry, Jordan Catton, Sally Case	Ly-Shu Ramos & Cari Kobialko, Project Permit Managers, Joanne Hunton-Sehdev & Kim Halowski, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director, Zack Barton Project Manager, Danielle Samels Permit Coordinator	Third Party Stakeholder	FEI provided an overview of FEI infrastructure and introduced the project scope and reviewed with MOTI the three locations where there are MOTI - TSU Project interactions. Communication protocols and contact information to be shared. FEI to submit drawings and Geotech logs.
18-Dec-20	Virtual Meeting	BC Hydro: Ronuk Bhayaabi, Bobby Malach	Ly-Shu Ramos, Project Permit Manager, Kim Halowski, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director, Zack Barton Project Manager, Danielle Samels & Tara Lindsay Permit Coordinators	Third Party Stakeholder	FEI reviewed the project scope and project description with the time frame of construction. While it is anticipated that there will be interaction between FEI and BC Hydro infrastructure at 23 of the 26 locations within the TSU scope, the discussion focused on locations with a higher degree of interaction. FEI to submit to BC Hydro property services drawings showing proposal in relation to transmission lines/cables, as well as the civic address.
6-Jan-21	Virtual Meeting	Telus: Gupinder Saran, Alex Huang, Anu George, Ka Hung Cho, Catalin Dobre, Steve Reader, Valeriu Juverdeanu	Ly-Shu Ramos & Cari Kobialko, Project Permit Managers, Joanne Hunton-Sehdev & Kim Halowski, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director, Zack Barton Project Manager, Danielle Samels Permit Coordinator	Third Party Stakeholder	FEI provided an overview of the Transmission System Upgrades Project and identified eight locations where FEI interacts with or is within proximity of Telus infrastructure. Telus enquired about work with underground conflicts. FEI to provide summary of scope of work for each location, construction methodology, and how it interacts with Telus infrastructure. Communication protocols were identified.
12-Jan-21	Virtual Meeting	Metro Vancouver: Ravi Grewal, Ron Nishimura, Cal Merry, David Tam, Darren Lee	Ly-Shu Ramos & Cari Kobialko, Project Permit Managers, Joanne Hunton-Sehdev & Kim Halowski, External Relations, Atif Ghani Pipeline Engineer, Susie Sengupta Project Director, Zack Barton & Aubin Merat, Project Managers, Danielle Samels Permit Coordinator	Third Party Stakeholder	FEI provided an overview of the Transmission System Upgrades Project and identified five locations where there are interactions with Metro Vancouver and provided a high level general scope for each piece of work. FEI will provide drawings that identify work close to Metro Vancouver infrastructure and determine where there is overlap.

Appendix J-3

PROJECT WEBPAGE

FORTIS BC Energy at work

Transmission System Upgrades



Overview Updates Community

About this project

We're planning work on our natural gas system at a number of locations in the Lower Mainland as part of our Transmission System Upgrades. This project will enhance the safety and reliability of the system we use to supply natural gas to hundreds of thousands of homes and businesses.

Why we're upgrading these gas lines

Transmission System Upgrades work will enhance our ability to monitor the condition of our gas lines by allowing us to use new, advanced in-line inspection tools. These gas lines have an excellent record for both safety and reliability. The work being planned will build on our already robust inspection and maintenance activities, to make sure these lines continue to provide safe, reliable service for many decades to come.

Construction overview

existing rights of way and FortisBC sites.

All of our gas lines are coated to help prevent corrosion and, as part of this project, we will be recoating some small sections of line. This recoating involves digging to expose the gas line so it can be inspected, the old coating can be removed, and the line cleaned and recoated.

We are also planning to complete some related routine gas line maintenance as part of the project.

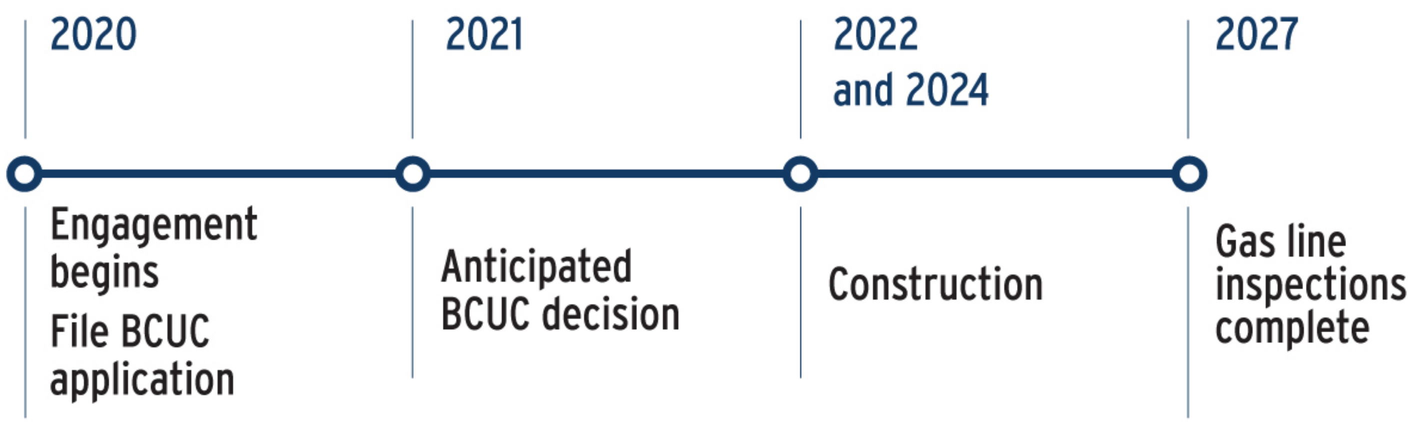
Similar in-line inspection tools being used on gas lines near Penticton.

Project timelines and next steps

We're in the early planning stages of this project and expect to file an application with our regulator, the British Columbia Utilities Commission (BCUC), later this year. Pending regulatory approval, work is expected to begin in 2022, with the majority of work planned for 2024. Gas line inspections will take place until 2027.

FORTIS BC Energy at work

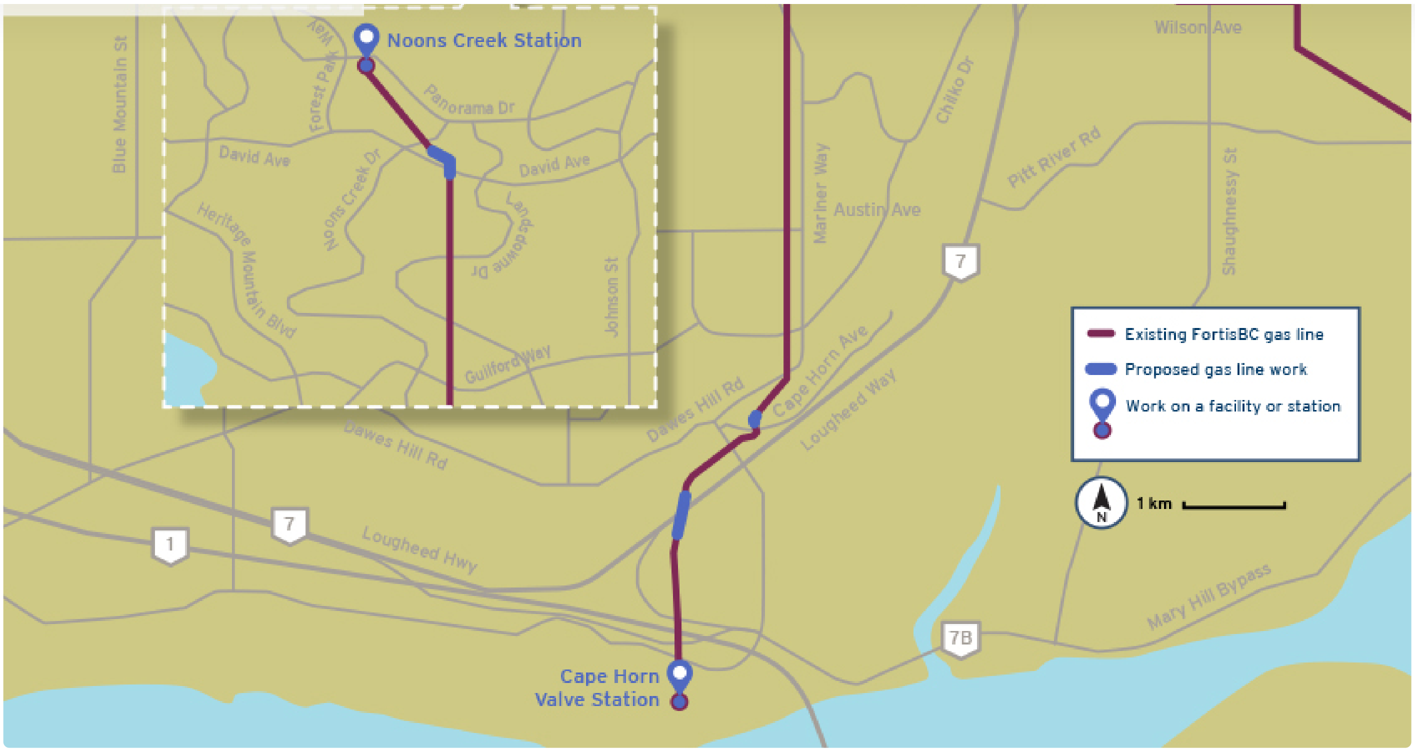
We're continuing with critical projects that support the everyday energy needs of customers and communities, including this gas line upgrade work, while adapting to the challenges of the current health crisis. We are committed to engaging with local municipalities, stakeholders, Indigenous communities and those living and working near where work will take place as part of this project.



Construction locations

Coquitlam

Work planned for 2024



Gas line work

- replace approx. 180m of gas line, crossing under Lougheed Hwy near San Antonio Place
- replace a section of gas line within right of way east of Cape Horn Ave
- replace a valve at Westwood Station and approx. 110m of gas line within right of way near David Ave, including a crossing of David Ave near Verbana Place

Facility work

- upgrade Cape Horn valve site on Rogers Ave
- upgrade Coquitlam Gate Station on Spuraway Ave
- upgrade Noons Creek Station near Forest Park Way, on the border between Port Moody and Coquitlam

Delta

Work planned for 2024

Gas line work

- replace two gas line bends, each approx. 5m, within right of way near 72 St and Hwy 17
- replace approx. 95m of gas line north of the Tilbury Regulating Station and crossing under River Rd

Facility work

- upgrade Tilbury Regulating Station on River Rd
- modifications to the Tilbury LNG Facility, comprising extending an existing in-line inspection tool receiver and relocating a gas line within the facility
- upgrade Benson Regulating Station at the intersection of Hwy 99 and Hwy 17

Surrey

Work planned for 2024

FORTIS BC Energy at work

- upgrade Latimer Station near 192 St and 96 Ave
- upgrade Port Mann valve site on 116a Ave
- upgrade Roebuck valve site on 132 St
- upgrade Nichol valve site on 138a St

Township of Langley

Work planned for 2024

Gas line work

- replace approx. 65m of gas line within right of way east of 232 St

Facility work

- upgrade Fort Langley Station, near Trattle St and Sailes Ave
- upgrade Livingstone Regulating Station near the intersection of 232 St and 56 Ave

Vancouver

Work planned for 2024

- upgrades to the Fraser Gate Station on East Kent Ave South

Abbotsford

Work planned for 2022

- upgrades to the King Rd valve site
- upgrades to the Huntingdon Regulating Station, off Whatcom Rd

Work planned for 2024

- upgrades to the Nelson valve site located near the intersection of Nelson and Blundell roads

Port Moody

Work planned for 2024

- upgrades to the Noons Creek Station near Forest Park Way, on the border between Port Moody and Coquitlam

Anmore

Work planned for 2024

- upgrades to the Anmore Station near the intersection of Sunnyside Rd and Ravenswood Dr

CALL US

604-592-7494

EMAIL US

transmissionupgrades@fortisbc.com

Ask a question

Stay in the loop

Subscribe to learn more about FortisBC related news, project updates and discussion topics.

About us Contact us

Privacy Policy

Appendix J-4

TALKING ENERGY NEWSLETTER

2020-10-29

Talking Energy

Your source for key project updates

Here's what we're talking about in our latest issue:

How we work with the community to deliver a major project

Do you ever wonder how the natural gas you use to heat your home or cook your food is available at the push of a button? Keeping gas flowing requires a lot of gas lines, connections, inspections and maintenance work – and FortisBC is an expert in this area.

We're committed to providing a reliable source of energy to our more than one million natural gas customers. To keep this customer promise, we not only monitor and inspect our gas lines regularly but upgrade, replace and maintain them as needed. We currently have a number of projects underway around the province to make sure we are delivering gas to you when you need it.

Coquitlam welcomes new forest trails for outdoor enthusiasts

As one of our community support initiatives, we recently helped fund upgrades and an expansion of the City of Coquitlam's Riverview Forest Park trails. These trails are centrally located and enjoyed by mountain bikers, hikers and trail runners.

This partnership reflects our commitment to supporting the communities where we work and operate. We completed construction on two major projects in the adjacent area over the past few years – our Surrey to Coquitlam natural gas line upgrades parallel to Mariner Way in 2017 and our gas line upgrades project along Como Lake Avenue in 2019. Providing funding to the Riverview Forest Park Trails is one way we can say thank-you to the community following this work.

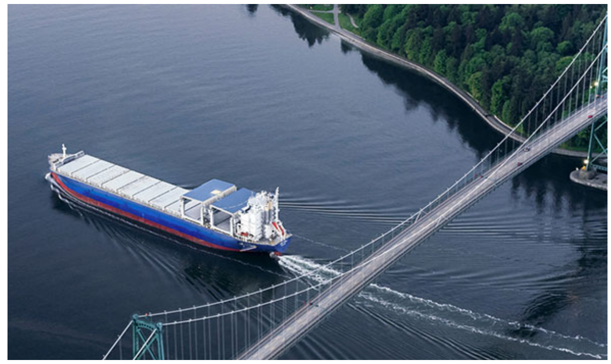
Connecting with communities

Keeping communities informed of the work we are doing in their area and getting feedback from them is important to us.

In August, we hosted two virtual information sessions in Squamish about our Eagle Mountain – Woodfibre Gas Pipeline project. During these sessions, we shared information about the project and members of the community in turn asked us questions and provided feedback. We shared the presentation afterwards for people who weren't able to attend.

Will we be hosting our next round of information sessions on this project in Squamish in November. Read more about these events and how to participate.

Environmental benefits of Tilbury LNG as a marine fuel



FortisBC's Tilbury LNG Facility is proving to have an important role to play in reducing greenhouse gas (GHG) emissions through both the production and use of its LNG. A recent GHG analysis by environmental consultant thinkstep (now Sphera) has found that Tilbury's LNG is produced with nearly 30 per cent less carbon intensity than global LNG on average. In addition, the same study found utilizing Tilbury LNG as a marine fuel in comparison to traditional petroleum-based fuels has the ability to reduce GHG emissions by up to 27 per cent.

By investing in Tilbury LNG, we hope to make Vancouver a hub for fuelling marine vessels with cleaner fuel while also lowering air pollutants at home and abroad. Not only does LNG provide B.C. with an economic opportunity but it is also a viable choice to demonstrate environmental responsibility.

Supporting Indigenous communities through project work

When worked kicked off on our Inland Gas Upgrades project this summer we were able to bring on board two local Indigenous-owned companies – Nupqu and Duz Cho Construction – to support our work in the Cranbrook, Sparwood and Mackenzie areas. Through these relationships we get reliable, quality work to support our project while also supporting contract opportunities for local Indigenous companies.

Nupqu specializes in natural resource management consulting and contracting services, and have played an important role in worksite clearing for our project in the Cranbrook/Sparwood area.

Duz Cho Construction is owned by the McLeod Lake Indian Band and was in charge of pre-construction site clearing activity in the Mackenzie area.

Learn more about Nupqu's work and Duz Cho's work and their innovative approaches in preparing workers for our project.

Transmission System Upgrades planned in the Lower Mainland

We recently started engagement on plans to upgrade our transmission gas line system in the Lower Mainland to allow us to run new in-line inspection tools through it. Work will take place at a number of our facilities and on rights of way as part of the Transmission System Upgrades project.

The majority of construction is anticipated to take place in 2024 and 2025, with some early work starting in 2022. We anticipate filing an application for the project with our regulator the B.C. Utilities Commission later this year.

If approved, upon completion this project will allow us to better monitor the condition of our gas lines to help us keep gas flowing to your homes in a safe and reliable manner.

Connect with us

16705 Fraser Hwy, Surrey, BC V4N 0E8

Appendix J-5

PROJECT NOTIFICATION LETTERS TO MUNICIPALITIES

16705 Fraser Highway
Surrey, BC
V1N 0E8

[redacted]
City of Coquitlam
3000 Guildford Way
Coquitlam, BC
V3P 7N2

October 1, 2020

Good afternoon,

Transmission System Upgrades
FortisBC is planning work on our natural gas system at a number of locations in the Lower Mainland as part of our Transmission System Upgrades. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance. The intention is that this work will occur at approximately 30 locations within the Lower Mainland on and near existing FortisBC rights-of-way and facilities.

We are beginning the process of filing for a Certificate of Public Convenience and Necessity with the British Columbia Utilities Commission (BCUC), including engaging with stakeholders, landowners and those living and working near where work will take place. We expect to file the application with the BCUC by the end of 2020, and pending approval the majority of construction work is expected to take place in 2024-2025.

Work within the City of Coquitlam
We are planning work at a number of locations within the City of Coquitlam as part of this project, mostly within statutory rights-of-way and our facilities. The work locations are included in the enclosed map and indicated below:

1. Replace approximately 177m of gas line underneath Lougheed Highway, near San Antonio Place (using a trenchless method).
2. Replace a small section of gas line within existing right-of-way, east of Cape Horn Avenue.
3. Replace a valve assembly at Westwood Station and approximately 109m of gas line within existing right-of-way near David Avenue, including a possible open cut across David Avenue, near Verbana Place.
4. Upgrade Cape Horn Valve Station on Rogers Avenue, including the replacement of approximately 18m of gas line within the facility.
5. Upgrade Coquitlam Gate Station on Spuraway Avenue, including the replacement of a valve within the facility.
6. Complete upgrades to Noons Creek Station on Panorama Drive.

After this work is completed, baseline inspections will take place until 2027 and further work may be required based on the results. We will keep the city informed of our progress.

FortisBC welcomes your input
In the weeks ahead, we will be reaching out to stakeholders and those living and working near our proposed worksites to gather feedback to support our application. We extend an invitation to the City of Coquitlam to discuss this work further and provide the opportunity to hear any concerns or questions you may have.

Sincerely,

Joanne Hunton-Sehdev
Community Relations, Major Projects
Enclosed: work location maps

Appendix J-6

PROJECT NOTIFICATION LETTERS TO PROPERTY OWNERS

16705 Fraser Highway
Surrey, BC
V4N 0E8

October 23, 2020

[redacted]
Langley BC [redacted]

Re: Transmission System Upgrades - 8036 232 St, Langley BC

FortisBC is planning work on our natural gas system at a number of locations in the Lower Mainland as part of our Transmission System Upgrades. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance. The intention is that this work will occur at approximately 30 locations within the Lower Mainland on and near existing FortisBC rights-of-way and facilities. The above referenced property has been identified as one of the locations that will be included in the scope of this project. FortisBC will continue to keep you notified of any activity to take place on your property.

We are beginning the process of filing for a Certificate of Public Convenience and Necessity with the British Columbia Utilities Commission (BCUC), including engaging with stakeholders, landowners and those living and working near where work will take place. We expect to file the application with the BCUC by the end of 2020, and pending approval the majority of construction work is expected to take place in 2024-2025.

We are planning work at a number of locations within the Township of Langley as part of this project, mostly within statutory rights-of-way and our facilities. Work locations are detailed below:

1. Right-of-way, east of 232 Street near 80 Avenue.
2. Right-of-way, near 65 Avenue and 208 Street.
3. Fort Langley Station, near Trattle Street and Sailes Avenue.
4. Glover Road Station, near Glover Road and Mufford Crescent Overpass.
5. Livingstone Station, near the intersection of 232 Street and 56 Avenue.
6. Balfour Station, near the intersection of 232 Street and 56 Avenue.

After this work is completed, baseline inspections will take place until 2027 and further work may be required based on the results.

You can learn more about this work at talkingenergy.ca, and we welcome your feedback. Please feel free to contact the writer at (604)576-7121 or colleen.bohun@fortisbc.com.

Sincerely,

C. Bohun

Colleen Bohun
Supervisor, Major Project Support
Property Services

Appendix J-7

PROJECT NOTIFICATION LETTERS TO RESIDENTS AND BUSINESSES

16705 Fraser Highway
Surrey, BC
V4N 0E8

October 30, 2020

Dear Neighbour,

Transmission System Upgrades
FortisBC is planning work on our natural gas system at a number of locations in the Lower Mainland as part of our Transmission System Upgrades. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance. The intention is that this work will occur at approximately 24 locations within the Lower Mainland on and near existing FortisBC rights-of-way and facilities.

We are beginning the process of filing for a Certificate of Public Convenience and Necessity with the British Columbia Utilities Commission (BCUC), including engaging with stakeholders, landowners and those living and working near where work will take place. We expect to file the application with the BCUC by the end of 2020, and pending approval the majority of construction work is expected to take place in 2024.

Work in your neighbourhood
We are planning work at a number of locations within the City of Coquitlam as part of this project, mostly within statutory rights-of-way and our facilities. Work locations are detailed below:

1. Lougheed Highway, near San Antonio Place.
2. Right-of-way, east of Cape Horn Avenue.
3. Westwood Station and right-of-way, near David Avenue and Verbana Place.
4. Cape Horn Valve Station, on Rogers Avenue.
5. Coquitlam Gate Station, on Spuraway Avenue.

After this work is completed, baseline inspections will take place until 2027 and further work may be required based on the results. We will keep the community informed of our progress.

FortisBC welcomes your input
We are reaching out to stakeholders and those living and working near our proposed worksites to gather feedback to support our application.

You can learn more about this work at talkingenergy.ca, please feel free to contact us at 604.592.7494 or transmissionupgrades@fortisbc.com.

Sincerely,

Joanne Hunton-Sehdev
Community Relations, Major Project

Appendix K

INDIGENOUS ENGAGEMENT

Appendix K-1

STATEMENT OF INDIGENOUS PRINCIPLES

Statement of Indigenous Principles

FortisBC is committed to building effective Indigenous relationships and to ensuring we have the structure, resources and skills necessary to maintain these relationships.

To meet this commitment, the actions of the company and its employees will be guided by the following principles:

- *FortisBC companies acknowledge, respect and understand that Indigenous Peoples have unique histories, cultures, protocols, values, beliefs and governments.*
- *FortisBC supports fair and equal access to employment and business opportunities within FortisBC companies for Indigenous Peoples.*
- *FortisBC supports fair and equal access employment and business opportunities within FortisBC companies for Indigenous Peoples.*
- *FortisBC will develop fair, accessible employment practices and plans that ensure Indigenous Peoples are considered fairly for employment opportunities within FortisBC.*
- *FortisBC will strive to attract Indigenous employees, consultants and contractors and business partnerships.*
- *FortisBC is committed to dialogue through clear and open communication with Indigenous communities on an ongoing and timely basis for the mutual interest and benefit of both parties.*
- *FortisBC encourages awareness and understanding of Indigenous issues within its work force, industry and communities where it operates.*
- *To achieve better understanding and appreciation of Indigenous culture, values and beliefs, FortisBC is committed to educating its employees regarding Indigenous issues, interests and goals.*
- *FortisBC will ensure that when interacting with Indigenous Peoples, its employees, consultants and contractors demonstrate respect, and understanding of Indigenous Peoples' culture, values and beliefs.*
- *To give effect to these principles, each of FortisBC's business units will develop, in dialogue with Indigenous communities, plans specific to their circumstances.*

FORTIS BC

Appendix K-2

SPATIAL OVERVIEW ENGINE REPORT

Report Date:	Tue Sep 29 09:56:58 PDT 2020

Adjacency Buffer:	5.0

Contacts for First Nation Consultation Areas 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	Cowichan Tribes
Contact Title	
Contact Organization	Cowichan Tribes
Contact Address	5760 Allenby Road
Contact City	Duncan
Contact Province	British Columbia
Contact Postal Code	V9L 5J1
Contact Phone	2507483196
Contact Fax	2507481233
Contact Email	Candace.Charlie@cowichantribes.com
Public Contact Comment	

Contact Name	Halalt First Nation
Contact Title	Chief and Council
Contact Organization	Halalt First Nation
Contact Address	7973 Chemainus Road
Contact City	Chemainus
Contact Province	BC
Contact Postal Code	V0R 1K5
Contact Phone	2502464736
Contact Fax	2502462330
Contact Email	manager@halalt.org
Public Contact Comment	

Contact Name	Katzie First Nation
Contact Title	Chief and Council
Contact Organization	Katzie First Nation
Contact Address	10946 Katzie Road
Contact City	Pitt Meadows
Contact Province	BC
Contact Postal Code	V3Y 2G6
Contact Phone	6044658961
Contact Fax	6044655949
Contact Email	landopsreferrals@katzie.ca
Public Contact Comment	

Contact Name	Kumba Boima
Contact Title	Lands Officer
Contact Organization	Kwantlen First Nation
Contact Address	P.O. Box 1023
Contact City	Fort Langley

Contact Province	BC
Contact Postal Code	V1M 2S4
Contact Phone	6048885556
Contact Fax	6048885544
Contact Email	referrals@seyemqwantlen.ca
Public Contact Comment	

Contact Name	Kwikwetlem First Nation
Contact Title	Referrals, Lands and Resources Department
Contact Organization	Kwikwetlem First Nation
Contact Address	2 - 65 Colony Farm Road
Contact City	Coquitlam
Contact Province	BC
Contact Postal Code	V3C 5X9
Contact Phone	6045400680
Contact Fax	6045250772
Contact Email	referrals@kwikwetlem.com
Public Contact Comment	

Contact Name	Lake Cowichan First Nation
Contact Title	Chief and Council
Contact Organization	Ts'uubaa-asatx First Nation
Contact Address	P.O. Box 159 313B Deer Road
Contact City	Lake Cowichan
Contact Province	BC
Contact Postal Code	V0R 2G0
Contact Phone	2507493301
Contact Fax	2507494286
Contact Email	carole@lcfn.ca
Public Contact Comment	

Contact Name	Shawn Gabriel
Contact Title	Referrals Administrator
Contact Organization	Leq'á:mel First Nation
Contact Address	43101 Leq'a:mel Way
Contact City	Deroche
Contact Province	BC
Contact Postal Code	V0M 1G0
Contact Phone	6048267976
Contact Fax	6048260362
Contact Email	referralsofficer@leqamel.ca
Public Contact Comment	

Contact Name	Lyackson First Nation
Contact Title	Chief and Council
Contact Organization	Lyackson First Nation
Contact Address	7973A Chemainus Road

Contact City	Chemainus
Contact Province	BC
Contact Postal Code	V0R 1K5
Contact Phone	18885925766
Contact Fax	2502465049
Contact Email	reception@lyackson.bc.ca
Public Contact Comment	

Contact Name	Matsqui First Nation
Contact Title	Chief and Council
Contact Organization	Matsqui First Nation
Contact Address	31989 Harris Road - PO Box 10
Contact City	Matsqui
Contact Province	BC
Contact Postal Code	V4X 3R2
Contact Phone	6048266145
Contact Fax	6048267009
Contact Email	
Public Contact Comment	

Contact Name	Musqueam Nation
Contact Title	Chief and Council
Contact Organization	Musqueam Indian Band
Contact Address	6735 Salish Dr
Contact City	Vancouver
Contact Province	BC
Contact Postal Code	V6N 4C4
Contact Phone	6042633261
Contact Fax	6042634212
Contact Email	
Public Contact Comment	

Contact Name	Penelakut Tribe
Contact Title	Chief and Council
Contact Organization	Penelakut Tribe
Contact Address	P.O. Box 360
Contact City	Chemainus
Contact Province	BC
Contact Postal Code	V0R 1K0
Contact Phone	2502462321
Contact Fax	2502462725
Contact Email	robert@penelakut.ca
Public Contact Comment	

Contact Name	People of the River Referrals Office
Contact Title	Referrals Administrator
Contact Organization	Stó:lo Nation
Contact Address	Building 10-7201 Vedder Road

Contact City	Chilliwack
Contact Province	BC
Contact Postal Code	V2R 4G4
Contact Phone	8005656004
Contact Fax	6048240278
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Peters First Nation
Contact Title	Chief and Council
Contact Organization	Peters First Nation
Contact Address	16870 Peters Road, RR#2
Contact City	Hope
Contact Province	BC
Contact Postal Code	V0X 1L2
Contact Phone	6047947059
Contact Fax	6047947885
Contact Email	
Public Contact Comment	

Contact Name	Seabird Island Band
Contact Title	Chief and Council
Contact Organization	Seabird Island Band
Contact Address	P.O. Box 650 - 2895 Chowat Road
Contact City	Agassiz
Contact Province	BC
Contact Postal Code	V0M 1A0
Contact Phone	6047962177
Contact Fax	6047963729
Contact Email	
Public Contact Comment	

Contact Name	Semiahmoo First Nation
Contact Title	Chief and Council
Contact Organization	Semiahmoo First Nation
Contact Address	16049 Beach Road
Contact City	Surrey
Contact Province	BC
Contact Postal Code	V3S9R6
Contact Phone	6045363101
Contact Fax	6045366116
Contact Email	mail@semiahmoofirstnation.org
Public Contact Comment	

Contact Name	Shxwowhámel First Nation - Referrals Administrator
Contact Title	Referrals Administrator
Contact Organization	Shxw'ow'hamel First Nation
Contact Address	58700A St. Elmo Road

Contact City	Hope
Contact Province	BC
Contact Postal Code	V0X 1L2
Contact Phone	6048692627
Contact Fax	6048699903
Contact Email	referrals@shxwowhamel.ca
Public Contact Comment	

Contact Name	Skawahlook First Nation c/o People of the River Referrals Office
Contact Title	Referrals Administrator
Contact Organization	Skawahlook First Nation
Contact Address	Building 10 - 7201 Vedder Road
Contact City	Chilliwack
Contact Province	BC
Contact Postal Code	V2R 4G5
Contact Phone	6048242420
Contact Fax	6048240278
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Soowahlie First Nation c/o People of the River Referrals Office
Contact Title	Referrals Administrator
Contact Organization	Soowahlie First Nation
Contact Address	Building 10-7201 Vedder Road
Contact City	Chilliwack
Contact Province	BC
Contact Postal Code	V2R 4G4
Contact Phone	6048242420
Contact Fax	6048240278
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Squamish Nation
Contact Title	Squamish Nation Council
Contact Organization	Squamish Nation
Contact Address	Squamish Nation Co-Chairs 320 Seymour Boulevard
Contact City	NORTH VANCOUVER
Contact Province	BC
Contact Postal Code	V7J 2J3
Contact Phone	6049820510
Contact Fax	6049820515
Contact Email	kristen_rivers@squamish.net
Public Contact Comment	

Contact Name	Stó:lo Nation
Contact Title	Council
Contact Organization	Stó:lo Nation

Contact Address	Building 10 - 7201 Vedder Rd
Contact City	Chilliwack
Contact Province	BC
Contact Postal Code	V2R 4G5
Contact Phone	6048583366
Contact Fax	6048245129
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Sto:lo Tribal Council
Contact Title	Council
Contact Organization	Stó:lo Tribal Council
Contact Address	P.O. Box 440 2855 Chowat Road
Contact City	Agassiz
Contact Province	BC
Contact Postal Code	V0M1A0
Contact Phone	6047960627
Contact Fax	6047960643
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Sumas First Nation c/o People of the River Referrals Office
Contact Title	Chief and Council
Contact Organization	Sumas First Nation
Contact Address	Building 10-7201 Vedder Road
Contact City	Chilliwack
Contact Province	BC
Contact Postal Code	V2R 4G4
Contact Phone	6048242420
Contact Fax	6048240278
Contact Email	referrals@peopleoftheriver.com
Public Contact Comment	

Contact Name	Stz'uminus First Nation
Contact Title	Office
Contact Organization	Stz'uminus First Nation
Contact Address	12611A Trans Canada Hwy
Contact City	Ladysmith
Contact Province	BC
Contact Postal Code	V9G 1M5
Contact Phone	2502457155
Contact Fax	2502453012
Contact Email	referrals@coastsalishdevcorp.com
Public Contact Comment	

Contact Name	Tsawwassen First Nation
Contact Title	Referral
Contact Organization	Tsawwassen First Nation
Contact Address	1926 Tsawwassen Drive

Contact City	Tsawwassen
Contact Province	BC
Contact Postal Code	V4M4G2
Contact Phone	6049432112
Contact Fax	6049439226
Contact Email	https://tsawwassenfirstnation.com/
Public Contact Comment	

Contact Name	Tsleil-Waututh Nation
Contact Title	Chief and Council
Contact Organization	Tsleil-Waututh Nation
Contact Address	3075 Takaya Drive
Contact City	North Vancouver
Contact Province	BC
Contact Postal Code	V7H 3A8
Contact Phone	6049293454
Contact Fax	6049294714
Contact Email	
Public Contact Comment	

Appendix K-3

PROJECT NOTIFICATION LETTERS TO INDIGENOUS GROUPS

FORTIS BC

16705 Fraser Highway
Surrey, BC
V1N 0E8

[redacted]
Cowichan Tribes
5760 Allenby Road
Duncan, BC
V9L 5J1

October 2, 2020

Greetings [redacted],

Transmission System Upgrades

FortisBC is planning work on our natural gas system at a number of locations in the Lower Mainland (please see attached map) as part of our Transmission System Upgrades. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use in-line inspection tools, as well as complete related maintenance.

The intention is that this work occurs at 32 locations in and near existing FortisBC rights-of-way and facilities. This work includes replacing or re-coating gas pipelines and upgrading the facilities. The majority of construction work is expected to take place in 2024-2025. After this work is completed, gas line inspections will take place until 2027 and further work may be required based on the results. We will keep your community informed of our progress.

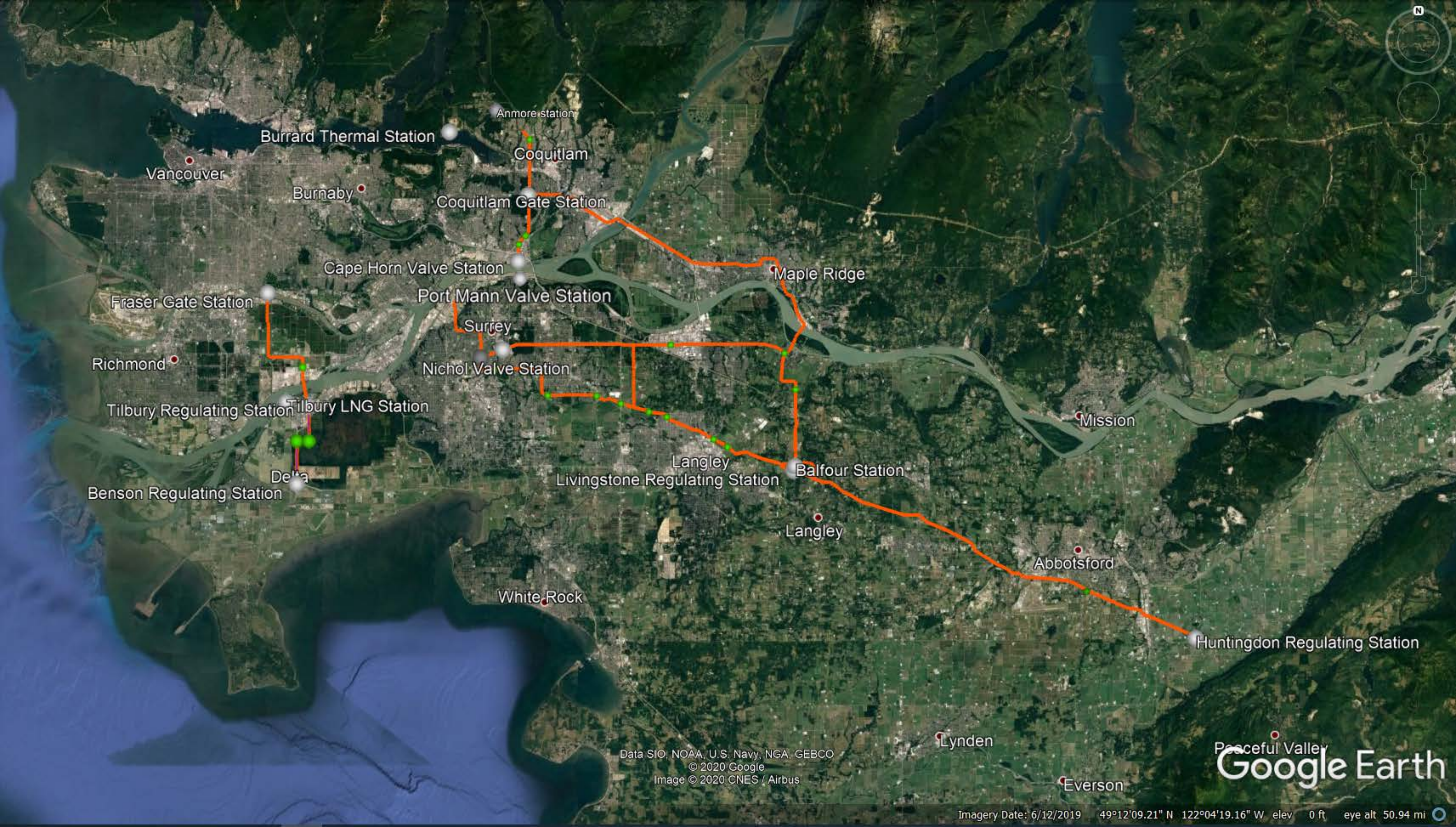
We value our relationship with your community, and believe strongly in transparent, ongoing engagement. We are in the early planning stages for this project and expect to file an application with the British Columbia Utilities Commission (BCUC) by the end of 2020.

In the weeks ahead, we look forward to hearing from you if you have further interest in this project. We will also be reaching out to provide you with our preliminary environmental and archaeological reports. If you have any comments, questions, or would like to speak further, we would be happy to set-up a virtual meeting or phone call at a time most convenient for you.

Sincerely,

Jason Simmonds

Jason Simmonds
Indigenous Relations Manager
External Relations, FortisBC
Jason.simmonds@FortisBC.com
Enclosed: work location maps

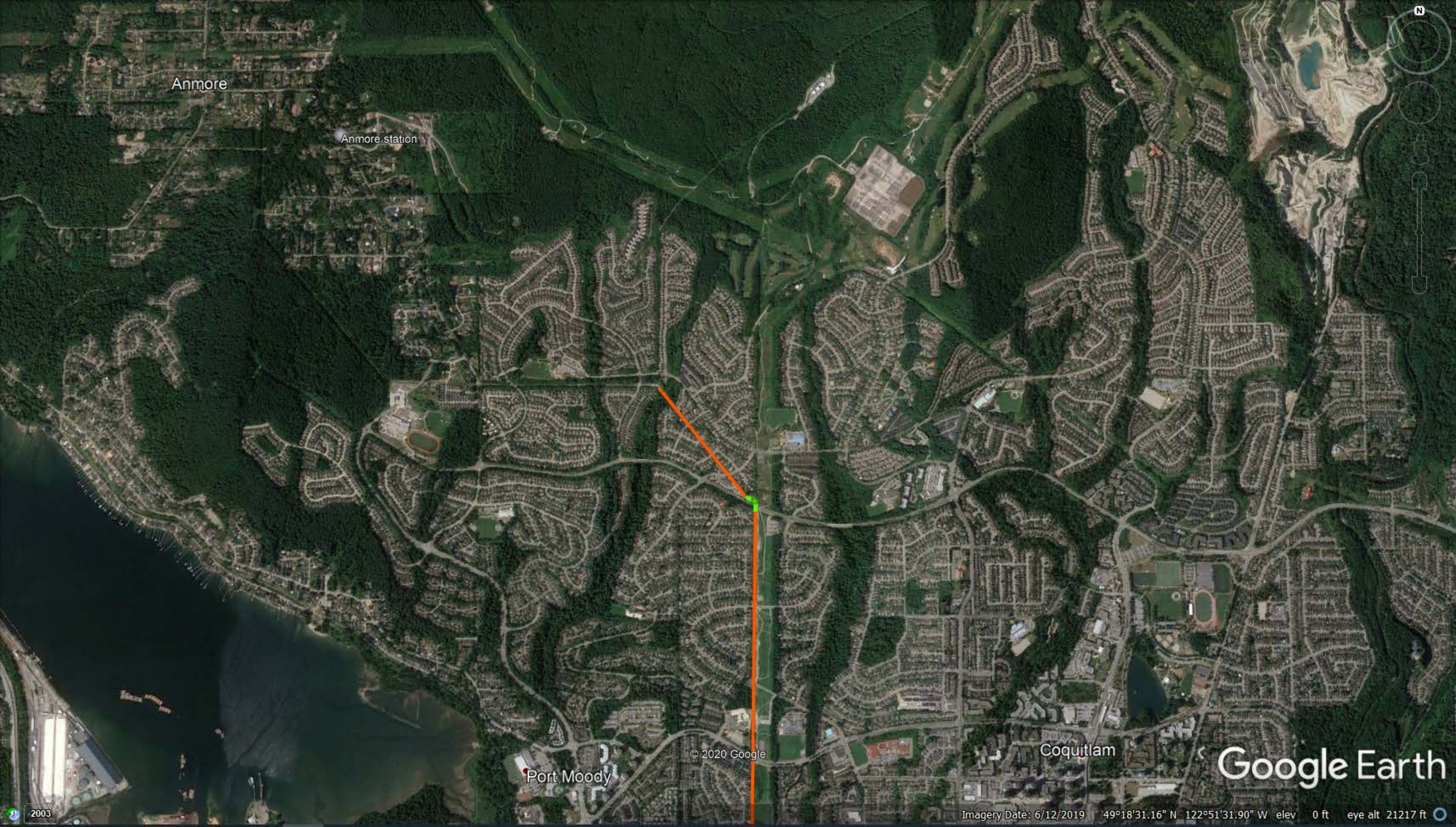

Anmore station
Burrard Thermal Station
Coquitlam
Vancouver
Burnaby
Coquitlam Gate Station
Cape Horn Valve Station
Maple Ridge
Fraser Gate Station
Port Mann Valve Station
Surrey
Richmond
Nichol Valve Station
Tilbury Regulating Station
Tilbury LNG Station
Mission
Langley
Balfour Station
Livingstone Regulating Station
Delta
Benson Regulating Station
Langley
Abbotsford
White Rock
Huntingdon Regulating Station
Lynden
Peaceful Valley
Everson
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2020 Google
Image © 2020 CNES / Airbus
Imagery Date: 6/12/2019 49°12'09.21" N 122°04'19.16" W elev 0 ft eye alt 50.94 mi


Delta
Sunbury
SFPR
17
Tilbury Regulating Station
80 St
Tilbury LNG Plant
76 Rd
River Rd
Tilbury
Progress Way
99
SFPR
Benson Regulating Station
Vancouver Blaine Hwy
17
Ladner Trunk Rd
17
Existing FortisBC gas line
Proposed gas line work
Work on a facility or station
N
1 km

Surrey
Roebuck Valve Station
Nicol Valve Station
Port Mann Valve Station
96 Ave
88 Ave
100 Ave
Barnstone Dr E
Golden Ears Way
82 Ave
80 Ave
76 Ave
74 Ave
72 Ave
68 Ave
64 Ave
132 St
King George Hwy
144 St
148 St
152 St
168 St
176 St
180 St
184 St
188 St
192 St
196 St
McBride Dr
Surrey Rd
Fraser Hwy
Harvie Rd
17
1
15
Existing FortisBC gas line
Proposed gas line work
Work on a facility or station
N
1 km

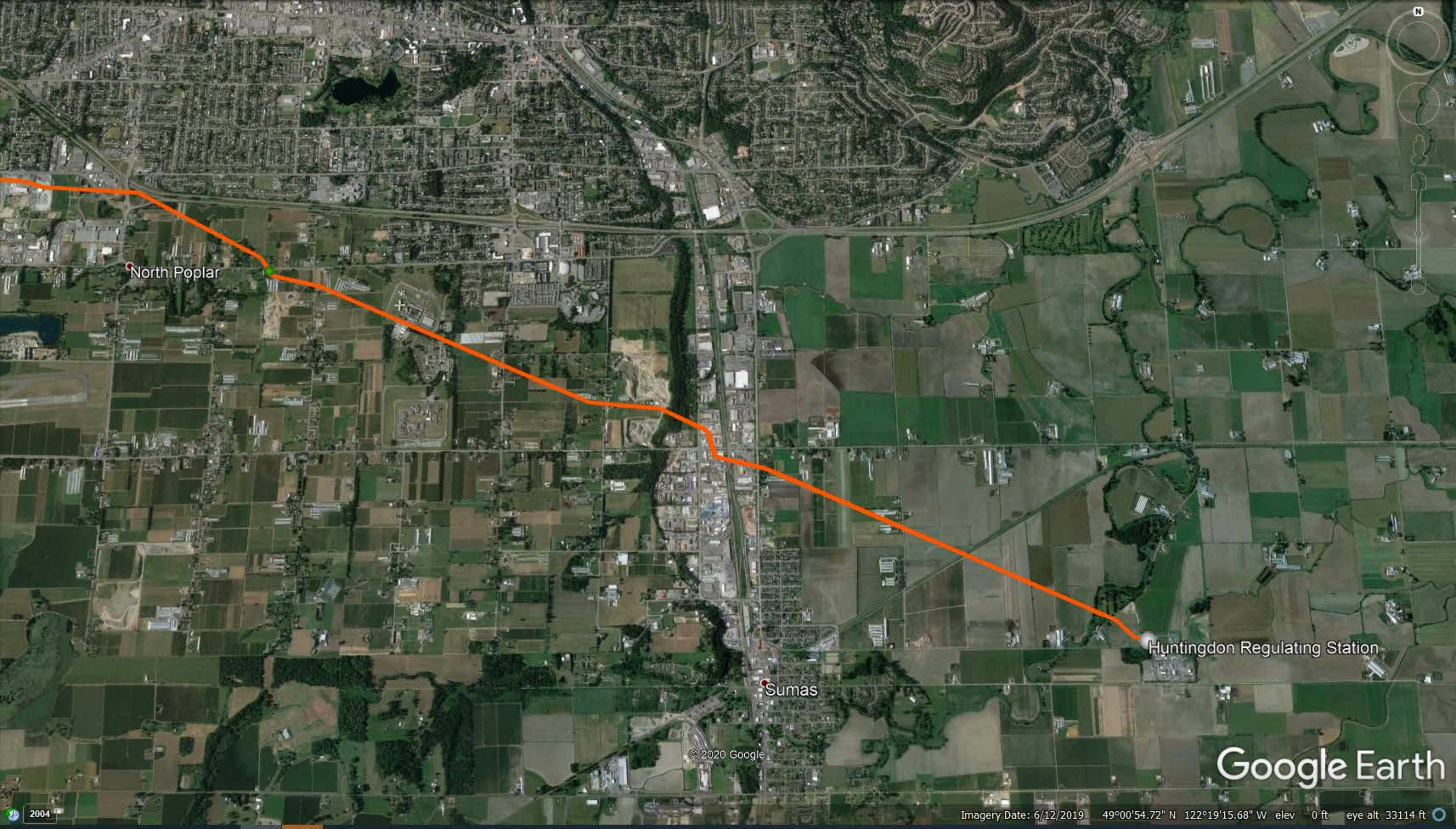

Coquitlam
Lake Ave
Coquitlam Gate Station
Noons Creek Station
Forest Park Way
Panorama Dr
David Ave
David Ave
Noons Creek Dr
Landsdowne Dr
Heritage Mountain Blvd
Johnson St
Guilford Way
Blue Mountain St
Wilson Ave
Chilko Dr
Mariner Way
Austin Ave
Pitt River Rd
Shaughnessy St
7
Dawes Hill Rd
Dawes Hill Rd
Cape Horn Ave
Lougheed Way
Lougheed Hwy
7
1
7B
Mary Hill Bypass
Cape Horn
Valve Station
Existing FortisBC gas line
Proposed gas line work
Work on a facility or station
N
1 km


Township of Langley
96 Ave
Walnut Grove
McMillan Island
88 Ave
88 Ave
Glover Rd
River Rd
Fort Langley
88 Ave
Existing FortisBC gas line
Proposed gas line work
Work on a facility or station
1
Forest Knolls
208 St
232 St
N
2 km
200 St
Jericho Rd
Glover Rd
72 Ave
72 Ave
Milner
248 St
64 Ave
1
224 St
232 St
Balfour Station
56 Ave
Livingstone Regulating Station



Anmore
Anmore station
Port Moody
Coquitlam
© 2020 Google
Google Earth
Imagery Date: 6/12/2019 49°18'31.16" N 122°51'31.90" W elev 0 ft eye alt 21217 ft
2003
N


Fraser Gate Station
Bridgeport Rd
Cambie Rd
Shell Rd
No 5 Rd
Vancouver Blaine Hwy
Number 6 Rd
Knight St
Number 7 Rd
Blundell Rd
River Rd
99
91
Google Earth
Imagery Date: 6/12/2019
49°10'05.27" N 123°04'42.49" W elev 0 ft eye alt 28645 ft


North Poplar
Huntingdon Regulating Station
Sumas
© 2020 Google
Google Earth
2004
Imagery Date: 6/12/2019 49°00'54.72" N 122°19'15.68" W elev 0 ft eye alt 33114 ft

From: Taylor, Heidi
To: [redacted]
Cc: Simmonds, Jason; Singbeil, Samantha
Subject: FortisBC Transmission System Upgrades
Date: Friday, October 2, 2020 3:18:00 PM
Attachments: TIMC - Notification Letter [redacted].pdf

Dear [redacted],

I hope this email finds you well. I am writing to you today to flag upcoming work on FortisBC's natural gas system as part of our Transmission Systems Upgrades. Work is planned at a number of locations in and near existing FortisBC rights-of-way and facilities in the Lower Mainland. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance.

FortisBC recognizes that this work is located within [redacted] consultative area. We value our relationship with your community, and believe strongly in transparent, ongoing engagement. Additional information about the project, including maps, are provided in the attached letter.

Next Steps:

- We are in the early planning stages for this project and expect to file an application with the British Columbia Utilities Commission (BCUC) by the end of 2020.
- We will also be reaching out to provide you with our preliminary environmental and archaeological reports.

If you have any questions or concern, please feel free to contact me.

Kind regards,
Heidi

Heidi Taylor | FortisBC | Indigenous Relations Liaison
C: 604.341.4912 | 16705 Fraser Highway | Surrey, BC | V4N 0E8

16705 Fraser Highway
Surrey, BC
V1N 0E8

[redacted]
Cowichan Tribes
5760 Allenby Road
Duncan, BC
V9L 5J1

November 6, 2020

Greetings [redacted],

Transmission System Upgrades

As a follow-up to our October 2, 2020 letter regarding the Transmission Systems Upgrade Project (the Project), enclosed you will find the Environmental Overview Assessment and Archaeological Constraints Report for your reference and review.

Since our initial correspondence, FortisBC has reduced the scope of work for this Project phase from 32 to 24 worksites (26 events). The eight removed worksites were in the Langley / Surrey area. An updated map reflecting this reduced scope is attached. Work will still occur in and near existing FortisBC right-of-ways throughout the Lower Mainland. We remain in the early stages of planning and are on track to file a Certificate of Public Convenience and Necessity (CPCN) to the BC Utilities Commission (BCUC) at the end of 2020.

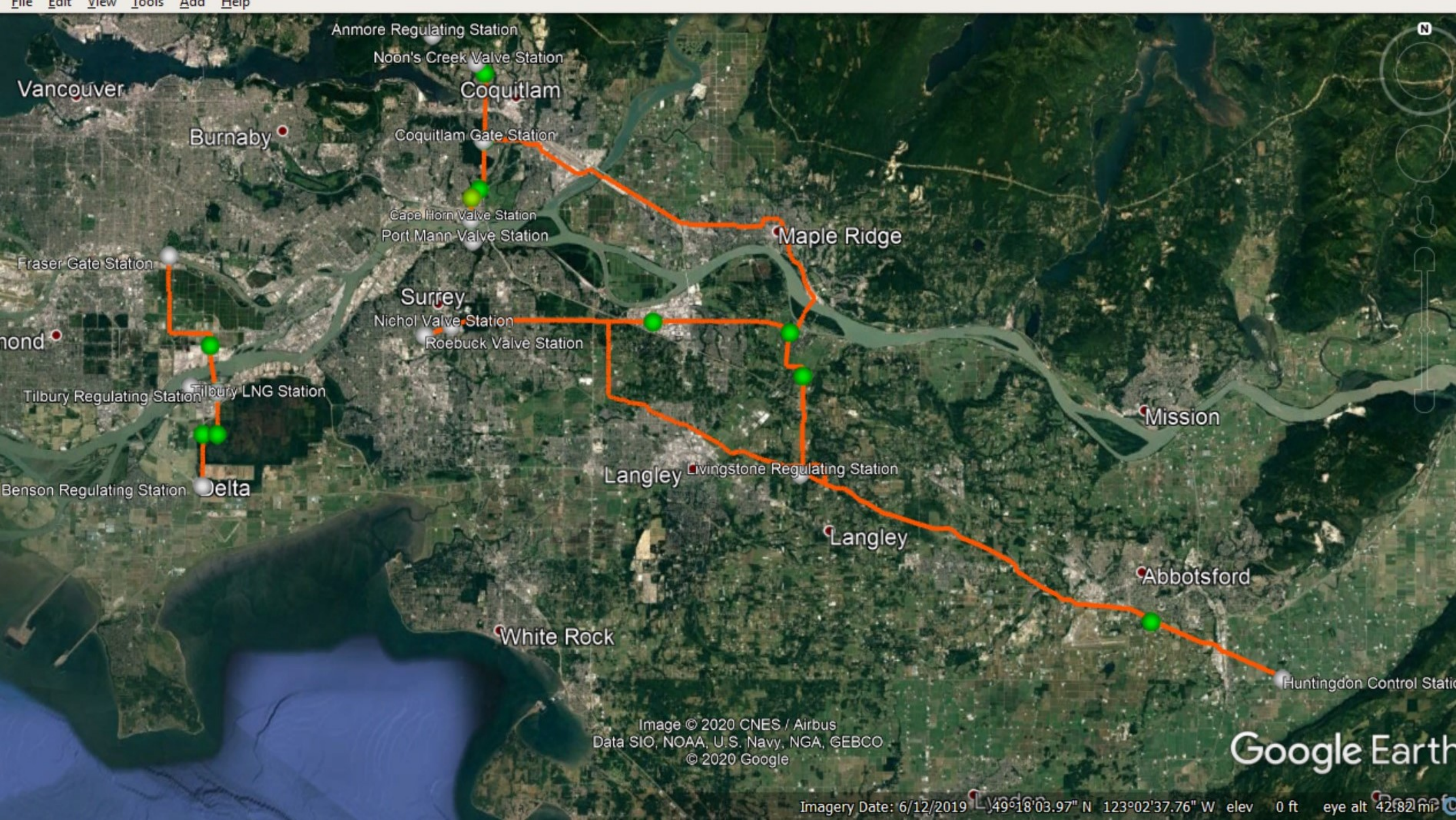
FortisBC recognizes that this work is located within [redacted] consultative area. We value our relationship with your community, and believe strongly in transparent, ongoing engagement. If you would like to discuss further or have any comments or questions, we would be happy to set-up a virtual meeting or phone call at a time most convenient for you.

Sincerely,

Jason Simmonds

Jason Simmonds
Indigenous Relations Manager
External Relations, FortisBC
Jason.simmonds@FortisBC.com

Enclosed: Environmental Overview Assessment
Review of Archaeological Constraints
Work location map


File Edit View Tools Add Help
Anmore Regulating Station
Noon's Creek Valve Station
Vancouver
Coquitlam
Burnaby
Coquitlam Gate Station
Cape Horn Valve Station
Port Mann Valve Station
Maple Ridge
Fraser Gate Station
Surrey
Nichol Valve Station
Roebuck Valve Station
mond
Tilbury Regulating Station
Tilbury LNG Station
Mission
Langley
Livingstone Regulating Station
Benson Regulating Station
Delta
Langley
Abbotsford
White Rock
Huntingdon Control Statio
Image © 2020 CNES / Airbus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2020 Google
Google Earth
Imagery Date: 6/12/2019 49°18'03.97" N 123°02'37.76" W elev 0 ft eye alt 42.82 mi

From: Taylor, Heidi
To: '[redacted].
Cc: Simmonds, Jason; Singbeil, Samantha
Subject: RE: FortisBC Transmission System Upgrades
Date: Friday, November 6, 2020 2:17:00 PM
Attachments: TSU (11-06-2020) [redacted] .pdf
EAO_ARCH_combined_20201106.pdf

Hello [redacted]

I am writing today to follow-up on the correspondence from FortisBC on October 2, 2020 with respect to the Transmission System Upgrades (TSU) project. We value dialogue with your community and wanted to reach out to see if there were any questions or comments at this time. Since our initial engagement, the scope of the project has been reduced and changes are reflected in the attached letter and updated project map. We have also included an Environmental Overview Assessment Report and Review of Archaeological Constraints for your review and reference.

Next steps:

- Continue dialogue with your community
- File for a Certificate of Public Convenience and Necessity (CPCN) with the British Columbia Utilities Commission (BCUC) by end of 2020

If you have any questions or concerns, please feel free to contact me.

Kind regards,
Heidi

Heidi Taylor | FortisBC | Indigenous Relations Liaison
C: 604.341.4912 | 16705 Fraser Highway | Surrey, BC | V4N 0E8

From: Taylor, Heidi
Sent: Friday, October 2, 2020 3:18 PM
To: [redacted]
Cc: Simmonds, Jason <jason.simmonds@fortisbc.com>; Singbeil, Samantha <Samantha.Singbeil@fortisbc.com>
Subject: FortisBC Transmission System Upgrades

Dear [redacted],

I hope this email finds you well. I am writing to you today to flag upcoming work on FortisBC's natural gas system as part of our Transmission Systems Upgrades. Work is planned at a number of locations in and near existing FortisBC rights-of-way and facilities in the Lower Mainland. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance.

FortisBC recognizes that this work is located within Cowichan Tribes consultative area. We value our relationship with your community, and believe strongly in transparent, ongoing engagement. Additional information about the project, including maps, are provided in the attached letter.

Next Steps:

- We are in the early planning stages for this project and expect to file an application with the British Columbia Utilities Commission (BCUC) by the end of 2020.
- We will also be reaching out to provide you with our preliminary environmental and archaeological reports.

If you have any questions or concern, please feel free to contact me.

Kind regards,
Heidi

Heidi Taylor | FortisBC | Indigenous Relations Liaison
C: 604.341.4912 | 16705 Fraser Highway | Surrey, BC | V4N 0E8

Appendix K-4

INDIGENOUS GROUPS ENGAGEMENT LOG

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
2-Oct-20	Notification Letter	Ashley Doyle, Lands Manager	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwantlen First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Leq'á:mel First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Alice McKay, Chief	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chris Raftis, Major Project Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Musqueam Indian Band	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Peters First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Effie Ned, Referrals Clerk	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Seabird Island Band	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Semiahmoo First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Shxw??whámel First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Robin Buss	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsawwassen First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Candace Charlie, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Cowichan Tribes	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Halalt First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Alli Di Giovanni, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Katzie First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals, Lands and Resources Department	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwikwetlem First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Aaron Hamilton	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Lake Cowichan First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Lyackson First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Josh James, Economic Development Officer	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Penelakut Tribe	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Chrystal Nahanee	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stz'uminus First Nation	Transmission System Upgrades Notification emailed.

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
2-Oct-20	Notification Letter	Kate Menzies, Consultation and Accommodation Manager	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stó:l? Tribal Council	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stó:l? Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Soowahlie First Nation,	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Skawahlook First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Sumas First Nation	Transmission System Upgrades Notification emailed.
2-Oct-20	Notification Letter	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office	Transmission System Upgrades Notification emailed.
2-Oct-20	Email	Candace Charlie, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Cowichan Tribes	Auto-reply that Cowichan Tribes is not working in-office.
2-Oct-20	Email	Katzie referrals	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Katzie First Nation	Auto-reply that Katzie is not working in-office.
5-Oct-20	Email	Sheila Williams / Robin Buss	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsawwassen First Nation	Sheila Williams replied to notify that Robin Buss is the appropriate contact for non-EA referrals; TWN will await environmental and archaeology report.
6-Oct-20	Email	TWN referrals	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	TWN sent Stewardship policy. FEI confirmed receipt.
7-Oct-20	Email	Deanna Rach	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office	PRRO requested shape file for StoloConnect. FEI sent .KMZ file.
8-Oct-20	Email	Deanna Rach	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office	PRRO was unable to use original .KMZ file. FEI followed up with file and PRRO confirmed receipt.
9-Oct-20	Email	Alice McKay, Chief	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Matsqui First Nation requested to have monitors on site.
13-Oct-20	Email	Alice McKay, Chief	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	FEI scheduled telephone call with Chief McKay to better understand Matsqui's interest in the project.

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
15-Oct-20	Phone	Alice McKay, Chief; Cynthia	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Phone introduction. Sent .KMZ file via email and will follow-up with teleconference on November 19th to discuss project timelines and sites important to Matsqui. Chief McKay is also interested in potential training opportunities.
27-Oct-20	email	Sarah Prien	Samantha Singbeil, Manager, IR; Amar Athwal, IR Manager; Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwikwetlem First Nation	KFN requested meeting to discuss capacity funding for TSU. FEI is in the process of negotiating a capacity funding agreement with KFN. FEI to discuss with KFN how TSU funding would be included in that agreement.
2-Nov-20	Email	Sarah Prien	Samantha Singbeil, Manager, IR; Amar Athwal, IR Manager; Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwikwetlem First Nation	KFN requested meeting to discuss capacity funding to participate in engagement activities on four FEI projects, including TSU. FEI will schedule a telephone meeting to follow-up.
6-Nov-20	Follow up letter (email)	Ashley Doyle, Lands Manager	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwantlen First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Leq'á:mel First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Alice McKay, Chief	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Chris Raftis, Major Project Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Musqueam Indian Band	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Peters First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
6-Nov-20	Follow up letter (email)	Effie Ned, Referrals Clerk	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Seabird Island Band	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Semiahmoo First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Shxw??whámel First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Robin Buss	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsawwassen First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Candace Charlie, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Cowichan Tribes	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Halalt First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Alli Di Giovanni, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Katzie First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals, Lands and Resources Department	Samantha Singbeil, Manager, IR; Amar Athwal, IR Manager; Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Kwikwetlem First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Aaron Hamilton	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Lake Cowichan First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
6-Nov-20	Follow up letter (email)	Chief and Council	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Lyackson First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Josh James, Economic Development Officer	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Penelakut Tribe	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Chrystal Nahanee	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stz'uminus First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Kate Menzies, Consultation and Accommodation Manager	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stó:l? Tribal Council	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Stó:l? Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Soowahlie First Nation,	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Skawahlook First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Sumas First Nation	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
6-Nov-20	Follow up letter (email)	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office	Sent follow up email with attached letter and enclosed updated project worksite map, Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)
9-Nov-20	email	Robin Buss	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsawwassen First Nation	Robin acknowledged receipt of documents (Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC)) and requested virtual meeting for additional project details once they have reviewed documents. FEI will set up meeting at TFN convenience.
9-Nov-20	Email	Aaron Marchant, Referrals Analyst	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	SN (Chrystal Nahanee) emailed to update contact information. All correspondence should be sent to Aaron
9-Nov-20	Email	Referrals Administrator, People of the River Referrals Office	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office	Auto reply: Carli Pierrot (Cheam, Kwaw'Kwaw'Apilt, Skwah) (People of the River Referrals Office) changed the status of 605765 - Transmission System Upgrades, Lower Mainland to Awaiting Analysis Response
10-Nov-20	Email	Aaron Marchant, Referrals Analyst	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	Invitation to join Squamish Connect Portal. Uploaded documents distributed to date as well as .KMZ file.
13-Nov-20	Email	Chris Raftis, Major Project Coordinator	Olivia Stanley, IR Manager	Musqueam Indian Band	Sent follow up email to MIB acknowledging their interests in the Delta/Burn's Bog area and FEI's commitment to ongoing engagement.
19-Nov-20	Virtual meeting (MS Teams)	Cynthia Collins	Samantha Singbeil, Manager, IR; Caroline Astley, Manger, Environment; Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	FEI presented an overview of the Project. Matsqui First Nation expressed interest in early involvement and will review Environmental Overview Assessment (EOA) and Archaeological Constraints Report (ARC). FEI will follow-up in early December to for a meeting to discuss the reports and continue discussions around Matsqui's interests.
19-Nov-20	Email	Aaron Marchant, Referrals Analyst/ Squamish Connect	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	Automatic update from Squamish Connect stating referral status changed to 'preliminary response'

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
20-Nov-20	email	Kate Menzies, Consultation and Accommodation Manager	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	TWN requested capacity funding for reviewing Environmental Overview Assessment (EOA), and Archaeological Constraints Report (ARC). FEI agreed and requested estimate.
24-Nov-20	Email	Aaron Marchant, Referrals Analyst	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Squamish Nation	Squamish Nation requested that FEI load spatial data to Squamish Connect Portal as original the portal could not read original .KMZ file. FEI provided disaggregated (19 individual files) .KMZ files showing worksites.
25-Nov-20	Email	Cynthia Collins	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Confirmed follow-up meeting for Dec 3, 2020
30-Nov-20	Email	Carli Pierrot, People of the River Referrals, Referrals Lead	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office (PRRO)	PRRO sent Technical Review report based on FEI's project information materials sent on October 2, 2020. FEI followed-up with PRRO and will host a virtual meeting in December to discuss PRRO's report and interests in the Project.
3-Dec-20	Virtual meeting (MS Teams)	Cynthia Collins	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Matsqui First Nation expressed interest in training and employment on the Project and with FEI more broadly. Matsqui is interested in having community monitors work alongside certified monitors for environmental and archaeological work. The are specifically interested in impacts to the Labrador tea and fish bearing streams. FEI committed to keeping Matsqui informed about upcoming project activities and to a follow-up meeting in February 2021 on the topic of training and employment.
3-Dec-20	Virtual meeting (MS Teams)	Carli Pierrot, People of the River Referrals, Referrals Lead	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office (PRRO)	FEI presented an overview of the Project. PRRO summarized a Technical Review report based on FEI's project information and explained areas of interest and concern. These areas of interest and concern included potential Project impact to cultural and heritage resources in the Abbotsford area (Sumas Lake) and to sensitive waterways. FEI committed to keeping PRRO informed about the Project as it advances and to providing additional materials, including results of an Archaeological Overview Assessment and Archaeological Impact Assessment once completed.
7-Dec-20	Email	Cynthia Collins	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Matsqui First Nation	Received Territorial map from Matsqui First Nation
11-Dec-20	Email	Candace Charlie, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Cowichan Tribes	Cowichan Tribes has reviewed the Environmental Overview Report, and Archaeological Constraints Report. They would like to be engaged on further archaeological activities around Tilbury and Richmond worksites.

TIMC - Indigenous Engagement Log

Date	Engagement Type	External Representative	FEI Representative	Indigenous Group	Summary
17-Dec-20	Email	Lauren Bell, Referrals	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	TWN provided estimate for reviewing Project materials and requested a spatial files. FEI provided .KMZ files
18-Jan-21	Virtual meeting (MS Teams)	Candace Charlie, Referrals Coordinator	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Cowichan Tribes	Cowichan Tribes would like to receive copies of future archaeological reports for review and comment. Cowichan Tribes are specifically interested in archaeological activities at Tilbury and Richmond work sites. FEI will continue to engage Cowichan Tribes on participating in future archaeological activities.
18-Jan-21	Email	Carli Pierrot, People of the River Referrals, Referrals Lead	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	People of the River Referrals Office (PRRO)	PRRO sent Final Engagement report via email which indicates that they would like to receive future report related to watercourse and environmental impacts for Delta, Surrey, Coquitlam, and Township of Langley. FEI has recorded the request and will continue to inform PRRO as the Project advances and provide copies of relevant materials.
19-Jan-21	Email	Lauren Bell, Referrals; Kate Menzies, Referrals Analyst	Jason Simmonds, IR Manager; Heidi Taylor, IR Liaison	Tsleil-Waututh Nation	TWN reviewed the Archaeological Constraints report and requested that FEI and its consultants apply for archaeological permits from TWN for each work site rather than one permit for the entire Project. This is due to the geographic scope of the Project and TWN's capacity to process such permit. FEI has noted the request for multiple permits and will work with archaeological consultants to obtain permits at the appropriate time. TWN notified FEI that, due to internal capacity, they are delayed in reviewing the Environmental Overview Assessment. FEI is awaiting those comments and will continue to engage TWN to address and interests or concerns.

Appendix L

DRAFT ORDERS AND UNDERTAKING OF CONFIDENTIALITY

Appendix L-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

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On February 11, 2021, FortisBC Energy Inc. (FEI) filed an application (Application) with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to section 45 and 46 of the *Utilities Commission Act* (UCA) for FEI's Coastal Transmission System (CTS) Transmission Integrity Management Capabilities (TIMC) Project (CTS TIMC Project);

B. In the Application, FEI also seeks approval, pursuant to sections 59 to 61 of the UCA, to recover the balance of costs in the TIMC Development Cost deferral account associated with the development of the CTS TIMC Application, estimated at $13.2 million, by amortizing the December 31, 2021 actual balance of these costs over 3 years commencing in 2022.

C. FEI states the CTS TIMC Project is needed to enhance FEI's integrity management capabilities to mitigate cracking threats on 11 CTS pipelines where such cracking has the potential to lead to failure;

D. FEI explains that the CTS TIMC Project consists of the work necessary to ready 11 pipelines on the CTS for in-line-inspection tools capable of detecting cracking on its pipelines. The components of the Project include:

1. Replacing 13 heavy wall pipeline segments in six of the CTS pipelines to enable the in-line inspection tools to travel within its optimal velocity range; and

2. Modifying 13 transmission pressure facilities on the CTS, to enable FEI to introduce the in-line inspection tools and install the capability to regulate flow, pressure, and backflow in their associated pipelines;

E. FEI requests that Appendices B, D, E, and G to the Application relating to engineering, cost estimates, and risk assessments be treated as confidential due to their private and commercially sensitive nature and to maintain the safety and security of FEI's assets; and

F. The BCUC has commenced review of this Application and considers that the establishment of a public hearing is warranted.

NOW THEREFORE the BCUC orders as follows:

1. A public hearing for the review of the Application is established, in accordance with the regulatory timetable as set out in Appendix A to this order (Regulatory Timetable).

2. FEI is to publish the Public Notice, attached as Appendix B to this order, in print/display-ad format in appropriate news publications, such as but not limited to, local and community newspapers to provide adequate notice to those parties who may have an interest in or be affected by the Application, as soon as reasonably possible, but no later than March 11, 2021.

3. As soon as practicable, FEI is directed to publish, together with any supporting materials, the Application, this order and the Regulatory Timetable and Public Notice by using appropriate communication methods, including FEI's website and social media accounts.

4. Appendices B, D, E, and G attached to the Application will be held confidential unless determined otherwise by the BCUC, due to their commercially sensitive nature and to maintain the safety and security of the FEI assets.

5. In accordance with BCUC's Rules of Practice and Procedure, parties who wish to actively participate in this proceeding must submit the Request to Intervene Form, available on the BCUC's website at https://www.bcuc.com/get-involved/get-involved-proceeding.html, by the date established in the Regulatory Timetable.

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 a Certificate of Public Convenience and Necessity for the Coastal Transmission System
Transmission Integrity Management Capabilities Project

REGULATORY TIMETABLE

Action	Date (2021)
FEI publishes notice of the Application	Thursday, March 11
Intervener Registration	Thursday, March 25
FEI Workshop*	Thursday, April 15
BCUC and Intervener Information Request No. 1	Thursday, April 29
FEI responses to BCUC and Intervener IR No. 1	Tuesday, June 1
Submissions on Further Process	Tuesday, June 15

* To be held virtually commencing at 9 a.m. Active participation in the workshop will be limited to the BCUC and registered interveners; however, any party may attend the live broadcast. Further details regarding the workshop will be issued in due course.

bcuc
British Columbia
Utilities Commission

We want to hear from you

FEI APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE COASTAL TRANSMISSION SYSTEM TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT

On February 11, 2021, FortisBC Energy Inc. applied to the British Columbia Utilities Commission (BCUC) for approval of a Certificate of Public Convenience and Necessity for its Coastal Transmission System (CTS) Transmission Integrity Management Capabilities (TIMC) Project. In the Application, FEI seeks approval to implement the CTS TIMC Project to enhance its integrity management practices to mitigate cracking threats on 11 pipelines in the CTS, and ensure that FEI continues to provide safe, reliable and environmentally responsible delivery of gas to customers served on the CTS.

More information on the application can be found at **bcuc.com** on our "Current Proceedings" page, a hard copy of the application is also available for review at the BCUC's office and FEI's head office.

HOW TO PARTICIPATE

- **Submit a letter of comment**
- **Register as an interested party**
- **Request intervener status**

IMPORTANT DATES

1. **Thursday, March 25, 2021** – Deadline to register as an intervener or file a letter of comment with the BCUC.
2. **Thursday, April 29, 2021** – Deadline for interveners to submit information requests No. 1

For more information on how to participate, please visit our website (www.bcuc.com/get-involved) or contact us at the information below.

GET MORE INFORMATION

FortisBC Energy Inc. Regulatory Affairs

16705 Fraser Highway
Surrey, BC Canada V4N 0E8

E: gas.regulatory.affairs@fortisbc.com

P: 604.592.7664

British Columbia Utilities Commission

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3

E: Commission.Secretary@bcuc.com

P: 604.660.4700

Appendix L-2

DRAFT C 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

FortisBC Energy Inc.
Application for Approval of a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management and Capabilities Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On February 11, 2021, FortisBC Energy Inc. (FEI) filed an application (Application) with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to section 45 and 46 of the *Utilities Commission Act* (UCA) for FEI's Coastal Transmission System (CTS) Transmission Integrity Management Capabilities (TIMC) Project (CTS TIMC Project);

B. In the Application, FEI also seeks approval, pursuant to sections 59 to 61 of the UCA, to recover the balance of costs in the TIMC Development Cost deferral account associated with the development of the CTS TIMC Project, estimated at $13.2 million, by amortizing the December 31, 2021 actual balance of these costs over 3 years commencing in 2022.

C. FEI states the CTS TIMC Project is needed to enhance FEI's integrity management capabilities to mitigate cracking threats on 11 CTS pipelines where such cracking has the potential to lead to failure;

D. FEI explains that the CTS TIMC Project consists of the work necessary to ready 11 pipelines on the CTS for electro-magnetic acoustic transducer (EMAT) in-line inspection (ILI) tools capable of detecting cracking on its pipelines. The components of the Project include:

   1. Replacing 13 heavy wall pipeline segments in six of the CTS pipelines to enable the EMAT ILI tools to travel within its optimal velocity range; and

   2. Modifying 13 transmission pressure facilities on the CTS, to enable FEI to introduce the EMAT ILI tools and install the capability to regulate flow, pressure, and backflow in their associated pipelines;

E. FEI requests that Appendices B, D, E, and G to the Application relating to engineering, cost estimates, and risk assessments be treated as confidential due to their private and commercially sensitive nature and to maintain the safety and security of FEI's assets; and

F. By Order G-##-21 dated [DATE], the BCUC established a regulatory timetable for the review of the Application which consisted of intervener registration, workshop, and one round of information requests (IRs); and

G. The BCUC has reviewed the evidence in the proceeding and finds that approval is warranted.

NOW THEREFORE pursuant to sections 45 to 46 and 59 to 61 of the *Utilities Commission Act* and for the reasons set out in the decision issued concurrently with this order, the British Columbia Utilities Commission orders as follows:

1. A CPCN is granted to FEI for the CTS TIMC Project as described in the Application.
2. FEI is approved to to recover the balance of costs in the TIMC Development Cost deferral account associated with the development of the CTS TIMC Project, estimated at $13.2 million, by amortizing the December 31, 2021 actual balance of these costs over 3 years commencing in 2022.
3. FEI is directed to comply with all directives outlined in Section # of the decision issued concurrently with this order.

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 L-3

CONFIDENTIALITY DECLARATION AND UNDERTAKING FORM

Confidentiality Declaration and Undertaking Form

In accordance with the Commission's 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, ____________________________, am representing the party ______________________________ in the matter of

FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project

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:	Documents filed confidentially 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 Commission any violation of this Undertaking.

Signed at ________________________ this ________________________.

Signature: ________________________

Name (please print): ___________________________________

Representing (if applicable): ____

Appendix M

LIST ACRONYMS

Acronym	Definition
ACR	Archaeology Constraints Report
AFUDC	Allowance for Funds Used During Construction
AIA	Archaeological Impact Assessment
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
AOA	Archaeological Overview Assessment
APEC	Areas of Potential Environmental Concern
ASL	Average Service Life
ASME	American Society of Mechanical Engineers
BCOGC	British Columbia Oil and Gas Commission
BCUC	British Columbia Utilities Commission
CAD	Consultative Areas Database
CEPA	Canadian Energy Pipeline Association
CMFL	Circumferential Magnetic Flux Leakage
COQ NOO 508	Coquitlam Regulating Station and Noons Creek Valve Station
CP	Cathodic Protection
CPCN	Certificate of Public Convenience and Necessity
CPH BUR 508	Cape Horn-Burrard 20” Pipeline
CPH NOO 508	Cape Horn to Noon’s Creek Pipeline segment
CSA	Canadian Standards Association

Acronym	Definition
CT	Cowichan Tribes
CTS	Coastal Transmission System
DBRS	Dominion Bond Rating Service
DP	Distribution Pressure
DSAW	Double Submerged Arc Weld
EAA	British Columbia Environmental Assessment Act
ECDA	External Corrosion Direct Assessment
EMAT	Electro-magnetic Acoustic Transducer
EOA	Environmental Overview Assessment
ERW	Electric Resistance Welding
FCS	Flow Control Skid
FEED	Front End Engineering Design
FEI	FortisBC Energy Inc.
FLNRORD	The Ministry of Forests, Lands, Natural Resource and Operations and Rural Development
HCA	*Heritage Conservation Act*
HDD	Horizontal Directional Drill
HFERW	High Frequency Electric Resistance Welding
HSTP	Hydrostatic Testing Program
HUN NIC 762	Huntingdon-Nichol 30” Pipeline
HUN ROE 1067	Huntingdon-Roebuck 42” Transmission Pipeline
IGU	Inland Gas Upgrade

Acronym	Definition
ILI	In-line inspection
IMP-P	Integrity Management Program - Pipeline
IP	Intermediate Pressure
IPC	International Pipeline Conference
ITS	Interior Transmission System
JANA	JANA Corporation
KFN	Kwikwetlem First Nation
LFERW	Low Frequency Electric Resistance Welding
LIV PAT 457	Livingston-Pattullo 18” Pipeline
LTGRP	Long Term Gas Resource Plan
MFL	Magnetic Flux Leakage
MFL-A	Magnetic Flux Leakage-Axial
MFL-C	Magnetic Flux Leakage-Circumferential
MFN	Matsqui First Nation
MIB	Musqueam Indian Band
MPI	Magnetic Particle Inspection
MOTI	Ministry of Transportation and Infrastructure
MRP	FEI’s Multi-Year Rate Plan for 2020 to 2024
MTO	Material Take-off
NACE	National Association of Corrosion Engineers
NOO BUR 508	Noon’s Creek to Burrard Pipeline segment

Acronym	Definition
NPS	Nominal Pipe Size
NPV	Net Present Value
OGAA	*Oil and Gas Activities Act*
PDCA	Plan-Do-Check-Act
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLE	Pipeline Exposure and Recoat
PLR	Pipeline Replacement
PRRO	People of the River Referrals Office
PRS	Pressure Regulating Station
QRA	Quantitative Risk Assessment
ROW	Right of Way
SAW	Single Submerges Arc Weld
SCC	Stress Corrosion Cracking
SCCDA	Stress Corrosion Cracking Direct Assessment
SME	Subject Matter Expert
SMYS	Specified Minimum Yield Stress
SN	Squamish Nation
SOE Reports	Spatial Overview Engine Reports
SRW	Statutory Rights-of-Way
Stantec	Stantec Consulting Ltd.
TIMC	Transmission Integrity Management Capabilities

Acronym	Definition
TP	Transmission Pressure
TPIP	Transmission Pipeline Integrity Plan
T-SouthSystem	Westcoast Energy’s T-South system
TSU Project	Transmission System Upgrades Project
TWN	Tsleil-Waututh Nation
UCA	*Utilities Commission Act*
UPI	Universal Pegasus International
Validation Estimating	Validation Estimating LLC, USA
VITS	Vancouver Island Transmission System
WACC	Weighted Average Cost of Capital
Westcoast	Westcoast Energy Inc.
YPCI	Yohannes Project Consulting Inc.
YVR	Vancouver International Airport